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14. ABSTRACT

In today's fiscally constrained environment, it is financially prudent to review all government programs to seek efficiencies and potential cost reductions. The Military Retirement System is no exception. The subject of retirement benefits for the members of our armed forces evokes strong interest among a diverse stakeholder group. Recent reviews of the Military Retirement System have been the subject of much discussion in the media. In view of this, a comprehensive evaluation framework must underpin any decision to change the current system. This work describes a methodology, rooted in value-focused thinking, which quantifies the trade-space of the Military Retirement System. We utilize this methodology to build a model through which to analyze and compare the current system with six alternatives. We present the results of this comparative analysis in terms of the cost of each alternative relative to the value each generates. While highlighting some important results, this study demonstrates an effective methodology to evaluate the trade-space of complex and resource intensive manpower decisions.

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Articulating Value: A Framework for Evaluating Military Retirement Alternatives

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Abstract

In today's fiscally constrained environment, it is financially prudent to review all government programs to seek efficiencies and potential cost reductions. The Military Retirement System is no exception. The subject of retirement benefits for the members of our Armed Forces evokes strong interest among a diverse stakeholder group. Recent reviews of the Military Retirement System have been the subject of much discussion in the media. In view of this, a comprehensive evaluation framework must underpin any decision to change the current system. This work describes a methodology, rooted in value-focused thinking, which quantifies the trade-space of the Military Retirement System. We utilize this methodology to build a model through which to analyze and compare the current system with six alternatives. We present the results of this comparative analysis in terms of the cost of each alternative relative to the value each generates. While highlighting some important results, this study demonstrates an effective methodology to evaluate the trade-space of complex and resource intensive manpower decisions.

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1.0 Introduction

The Military Retirement System (MRS) is expensive. In FY2010, the US Government spent over $50 Billion on military retirement (DoD Office of the Actuary, *Valuation of the Military Retirement System*, 5). When it comes to changing the MRS, the real issue at stake is how much value the government is willing to purchase. This study is based upon the underlying premise that attracting and retaining quality individuals to serve careers in the military is how the government realizes the value in a retirement system. Service members, however, operate on a different set of criteria to determine what brings them value. We must treat the service member as the consumer, who must make decisions whether to continue or leave military service. Some service members will arrive at this personal decision point multiple times during their time in service and will consider many things when making this decision, not the least of which is patriotism. Regardless of these other considerations, the total compensation package, which includes both current pay and allowances and deferred compensation (i.e. retirement pay), will most certainly be a significant consideration. This study focuses on the MRS and views the service member as the consumer in the retirement system, with the economic exchange being not money, but time in service. The issue of changing the MRS, at the most basic level, is a cash flow problem. If we are to reduce the cost of the MRS, we must offer a series of cash flows that are attractive enough to retain the quality individuals that have historically filled the ranks of our all-volunteer force yet result in a lower net cost to the government.

1.1 Background

In 2010, Defense Secretary Robert Gates ordered an evaluation of the Department of Defense (DoD) to reduce spending and more effectively allocate department dollars. One area in particular under review was the MRS (Leed, 1). He charged the Defense Business Board (DBB) to evaluate the current system and make recommendations that would save money in the future. In October 2011, the DBB publicly released its proposal that would reduce and delay retirement dollars to those currently eligible and introduce benefits for individuals not previously entitled. This merited much attention from the U.S. media and resulted in outcries from special interest groups, retirees, and service members against the proposed significant reduction of military retirement benefits.

Analysts have written volumes on military retirement and the broader topic of military compensation since the Gates Commission proposed the all-volunteer military force in 1970 (Harrison, 5-6). The Defense Business Board's public release of their retirement proposal, the ensuing media attention, the growing concerns over the budget deficit and growing national debt, and stagnant economic conditions have brought this issue into the DoD budget reduction discussion. The subject of reducing military retirement benefits can elicit an overwhelming emotional response, especially during a time of persistent military conflict such as we have recently experienced for over a decade. However, the recent end to the war in Iraq and imminent

draw-down in Afghanistan, coupled with the aforementioned national financial conundrum, make change a real possibility. There will undoubtedly be stiff political resistance to change a system that, for so many years, has been viewed as the reward for the faithful service and sacrifices of those who commit long-term to the military. But if it can be shown that DoD can deliver an acceptable level of value to the retiring service member at less cost than the current system, the obstacles to reform can be overcome.

1.2 The Military Retirement System

The MRS is a non-contributory, defined-benefit plan that pays a monthly annuity to qualified Service Members and qualified survivors. Currently, there are three formulas for computing the monthly annuity: Final Pay, High-3, and Career Status Bonus (CSB)/Redux. Retired pay utilizing the Final Pay formula (applies to service members who joined service before 8 September 1980) is computed by taking a retiree's final basic pay and multiplying it by a 2.5% multiplier by years of service. Retired pay utilizing the High-3 formula (applies to service members who joined service on or after September 8, 1980) is computed by taking the average of the highest three years of basic pay and multiplying it by a 2.5% multiplier by years of service. Both of these systems presume that the service member has completed a minimum of 20 years of service. Under the CSB/Redux plan, a service member receives a $30,000 cash bonus at fifteen years of service but must agree to complete 20 years of service. Retired pay utilizing the CSB/Redux formula (applies to service members who joined after 1 August 1986 and elect the CSB/Redux option) is computed by taking the average of the highest three years of basic pay multiplied by a 2.5% multiplier by years of service for those who serve at least 30 years. Service members retiring under CSB/Redux with more than 20 but less than 30 years of service incur a 1% penalty for each year short of 30 years of service. For example, under the High-3 formula, a service member retiring at 20 years of service would receive 50% of the average of the highest three years of base pay, whereas under CSB/Redux, the service member would receive the same 50% minus a 10% (1% for each year of service less than 30) penalty. At age 62, the penalty is removed and the retired pay multiplier is recomputed.

There are 3 categories of military retiree: non-disabled, disabled, and reserve service. For non-disabled retirement, service members must serve 20 years in the active component to receive retired pay. Retiring reservists must have 20 years of qualifying service and be at least 60 years old to receive retired pay. A qualified disabled retiree can choose to receive retired pay equal to the accrued non-disabled retirement (regardless of retirement eligibility) or base pay multiplied by the rated percent of disability. All military retirements are adjusted annually with a cost-of-living adjustment (COLA) to offset inflation, but retirements under the CSB/Redux plan are adjusted at a rate less than the full COLA.

The MRS also has a survivor benefit component, the Survivor Benefit Plan (SBP). This benefit pays up to 55% of the deceased service member's retired pay to a designated, qualified

beneficiary. The cost for the SBP is shared by the retiree and the government, thus it is not self-sustaining (DoD Office of the Actuaries, *Valuation*, 43-48).

1.3 Methodology

This study demonstrates a methodology to compare the cost of a retirement alternative against the value it generates. This methodology, known as the Systems Decision Process (SDP), facilitates a holistic, systematic problem-solving approach. The SDP consists of four phases: Problem Definition, Solution Design, Decision Making, and Solution Implementation. This study steps through the first three phases of the methodology while examining the current MRS along with six military retirement alternatives. In the subsequent pages of this document, we explain the process and results of each phase in sequential order. While no model is perfect (and we attempt to identify shortcomings as we proceed), we believe the SDP enabled us to perform some insightful analysis, demonstrate this methodology for future use, and highlight specific areas for further study.

2.0 Problem Definition

2.1 Problem Statement

We begin the discussion of problem definition with our problem statement:

> ***Develop a competitive monetary retirement benefits package to qualified service members that protects the financial security of service members and their families in order to maintain an effective all-volunteer force***.

The first element of the problem statement introduces the idea of competition. Why do we need a competitive retirement benefits package, and with whom is the military competing against in this domain? The competition is from civilian employers who exert "external…private market pressures" with the benefits they offer (DoD, *Military Compensation Background Papers*, 6). The reason for the military to engage in such a competition is the need to attract and retain quality men and women to lead America's armed forces.

To gain a thorough understanding of the issues surrounding a change to the MRS, we applied systems thinking techniques, conducted research and stakeholder analysis, executed functional analysis, and performed value modeling.

2.2 Systems Thinking

We utilized the following systems thinking concepts to visualize where the MRS fits into the military compensation apparatus, solidify the scope of our effort, and deepen our understanding of the issues at stake: system boundary, spatial arrangement, system visibility, and IDEF0 modeling.

2.2.1 System Boundary

System boundary analysis enables us to isolate the system under study from its external environment. In the system boundary diagram below, we can see the inputs and outputs to the system as well as internal and external feedback. It is of particular importance to note that the retention behavior of service members serves as a signal of their level of satisfaction with the current system. Additionally, it is important to note that the analysis is confined to the monetary benefits earned by retiring military personnel and does not include medical benefits available to retirees.

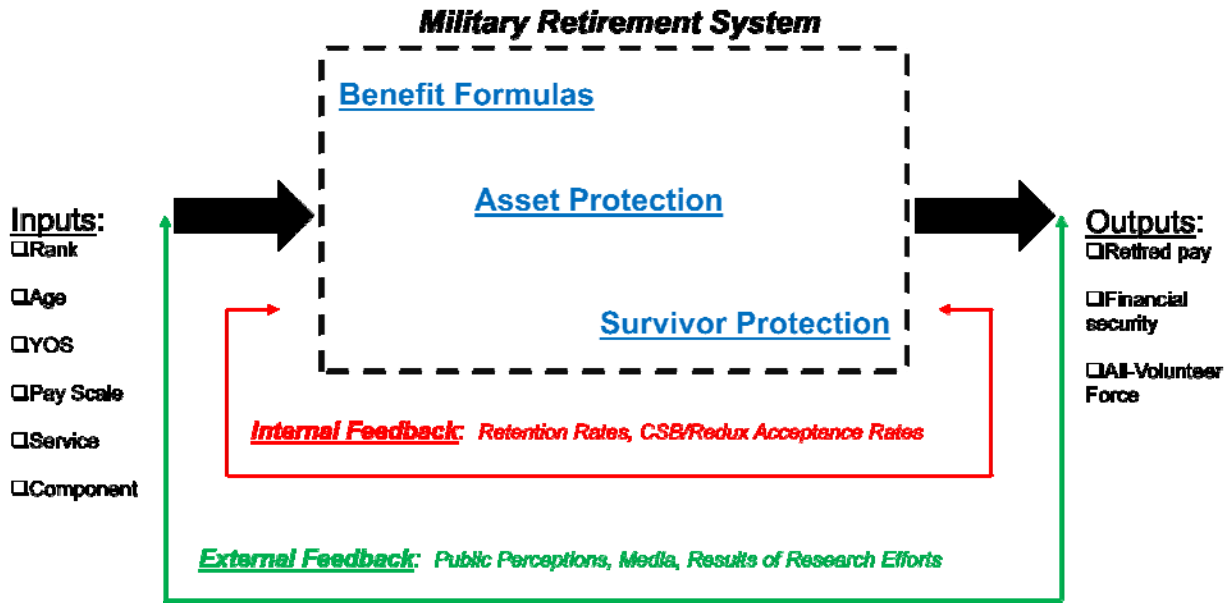


Figure 2.1 Military Retirement System Boundary

2.2.2 System Visibility

The MRS is a white box system. That is, the MRS offers transparency of how the system components operate to transform inputs into outputs (Driscoll, 40). Under the current system, a service member entering the military should know (if desired) exactly how her retirement pay will be computed. There are websites that publish retirement eligibility and benefits information as well as customer service interfaces available to help service members understand the system and make educated decisions. Additionally, the system is mature; as such, service members have had generations to learn a system that has seen few modifications in over a half century (Christian, 2-3).

2.2.3 Spatial Arrangement

The spatial arrangement displays the physical or conceptual structure of the system in terms of the metasystem, systems, subsystems, and elements. This enables us to better understand where the MRS fits into the larger compensation structure. The chart below is derived from Karl Gingrich's active duty service member compensation chart (page 7) and depicts the spatial arrangement of the MRS.

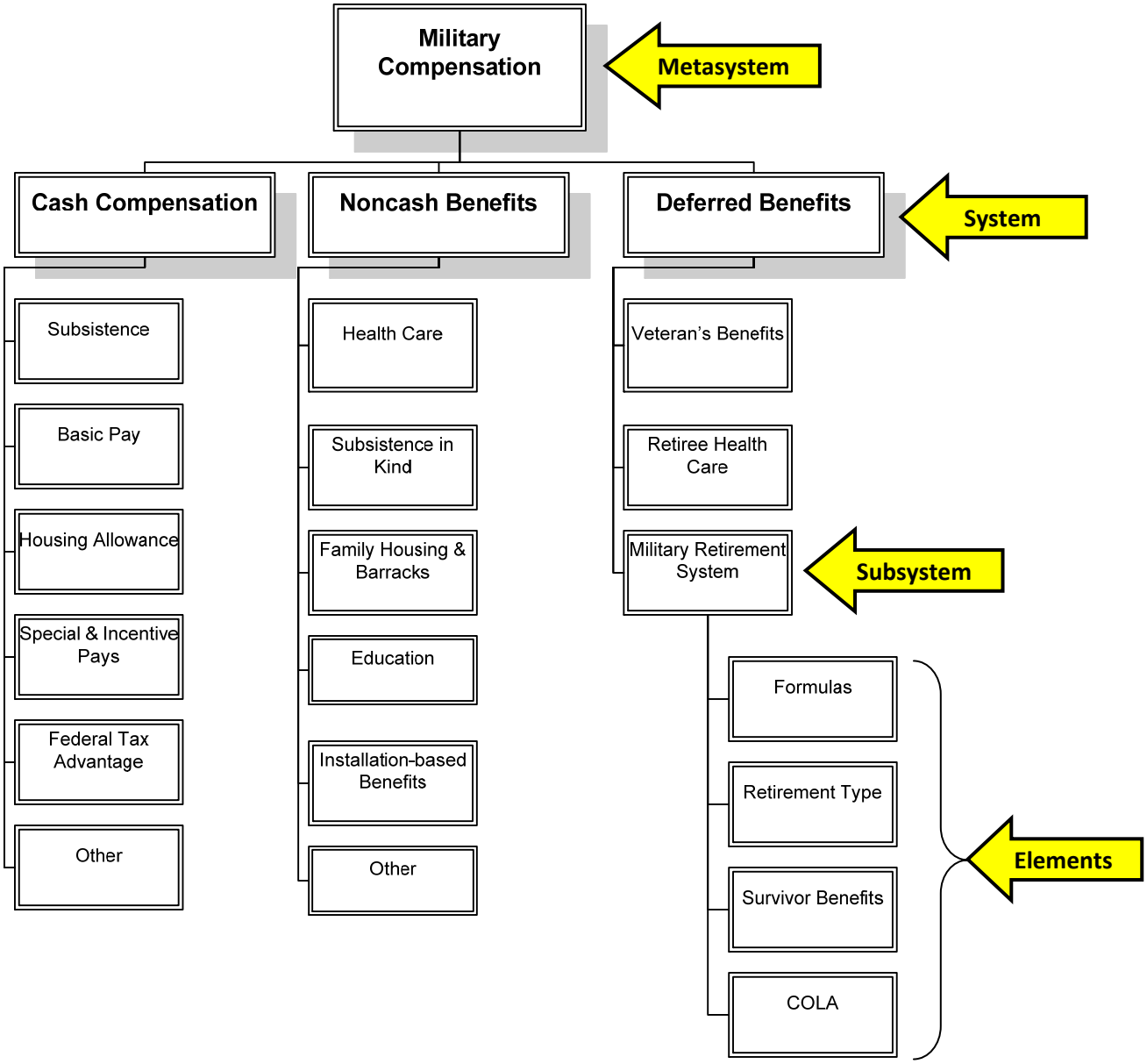


Figure 2.2 Spatial Arrangement of the Military Retirement System

2.3 Research

The military retirement issue has been thoroughly examined over the years. The bibliography includes references for a number of these studies. While analysts have carefully articulated an innumerable and broad range of ideas, we highlight in the next several pages some of the foundational concepts that shaped our thinking.

2.3.1 Recent Research

We recognize the important role that history plays in shaping the military retirement issue. In *An Overview of Past Proposals for Military Retirement Reform*, John Christian offers a concise

synopsis of the origins and the remarkable staying power of some of the key features we see in our current system today. He follows this thoughtful review with an overview of military retirement research up to the year 2003 organized around the issues of cost, equity, selective retention, civilian comparability, and force management flexibility (ix-15).

Subsequently, Charles Henning's *Military Retirement Reform: A Review of Proposals and Options for Congress*, discusses recent military retirement reform proposals since 2006. This review includes several prominent works shown in the table below:

The Defense Advisory Committee on Military Compensation (DACMC)	2006
The 10th Quadrennial Review of Military Compensation (QRMC)	2008
The Quadrennial Defense Review Independent Panel	Review of 2010 QDR
The Sustainable Defense Task Force	2010
The Defense Business Board	2010
The Debt Reduction Task Force	2010
The National Commission on Fiscal Responsibility and Reform	2010
Living Within Our Means and Investing in the Future: The President's Plan for Economic Growth and Deficit Reduction	2011

Table 2.1 Recent Military Retirement Proposals

2.3.2 Current Versus Deferred Compensation

Current and deferred compensation both have their place in the military compensation structure. Military retirement is deferred compensation, and according to the 10th Quadrennial Review of Military Compensation (QRMC), it has a distinct effect on retention as it creates a "…strong incentive for personnel who have reached 10-12 years of service to continue their service until they reach 20 years…" (page 10). At the same time, the 10th QRMC expresses concerns with the efficiency of deferred compensation, citing a preference among younger generations for cash over deferred benefits. Additionally, the report argues that individuals discount future benefits at a higher rate than the government discounts future costs (DoD, *10th QRMC*, 3). While we acknowledge the efficiency concerns with deferred compensation, we also recognize its importance in retention and force management.

2.3.3 Purposes of Military Compensation

In order to develop a military retirement alternative, it is essential to understand the purpose of military compensation and, specifically, of retired pay. The *Military Compensation Background Papers (6th Edition)* addresses the principles underlying military compensation. What follows is a synopsis of these principles (pages 4-9).

- Military compensation and manpower are interrelated and the compensation system must be an integral part of managing manpower.
- Military compensation must keep pace with the evolution of modern warfare and associated technologies. Our military must implement compensation changes or

new incentives as required to fill manpower requirements of a technologically evolving force.

- Military compensation must be equitable in terms of its comparability with civilian counterparts and competitiveness to counteract labor market pressures as well as solicit volunteers internally for special skill jobs or arduous duty.
- Military compensation must be effective in times of war and peace.
- Military compensation must be flexible as force requirements change frequently.
- Military compensation must motivate individuals to perform at high levels.

The *Military Compensation Background Papers (6th Edition)* also addresses compensation sub-principles for military retirement. First, military retirement should be structured to meet defense requirements such as active duty recall of retired members in support of national security objectives. Second, the system should support and enhance the force management requirements to maintain a young and vigorous force. Asch and Warner argue that the purpose of retired pay is to "...provide incentives for the most talented to stay and seek advancement and for others to leave after they discover they are unsuitable for advancement to the upper level positions" (*A Policy Analysis of Alternative Military Retirement Systems*, 20). Retired pay must incentivize talent to remain in the ranks because of the lateral entry constraint, due to the nature of military service, which prevents the military from filling advanced positions with lateral entry personnel. In Asch & Warner's view, retired pay takes care of the sorting required to fill critical positions internally (*A Policy Analysis*, 20). Finally, the system should be integrated with the military compensation system and replace and maintain a level of income acceptable to the American public (*Military Compensation Background Papers (6th Edition),* page 10).

2.3.4 Federal Trust Funds

The Military Retirement Fund is a non-revolving federal trust fund and one of over 200 federal trust funds maintained in the federal budget (CBO, *The Budget and Economic Outlook: Fiscal Years 2010 to 2020*, 115). A federal trust fund is simply an accounting mechanism. The Government Accountability Office says, "Federal trust funds represent one accounting mechanism used to link earmarked receipts with the expenditures of those receipts" (US GAO, *Federal Trust and Other Earmarked Funds*). The Congressional Budget Office explains the operational characteristics of federal trust funds as, "…simply accounting devices. As money is collected, it is deposited in the Treasury, and the appropriate trust funds are credited with federal securities to reflect the amounts" (*Federal Debt and the Commitments of Federal Trust Funds*, 3).

Federal trust fund holdings are not assets of the government. Federal trust funds that hold surplus balances are issued non-marketable government securities that are assets to the fund, but are a liability to the general fund and overall neither an asset nor a liability to the Federal Government. A surplus "….often represents a reserve of future 'spending authority' for the program" (CBO, *Federal Debt*, 1). These surplus balances represent the resources available to

pay retirees at some point in the future, but are backed only by the faith in the government to make good on its promise. The balances in federal trust funds consist mostly of non-marketable securities, not cash. As fund balances are spent, the expenditures are not resources that have been "saved for a rainy day", rather, they are resources generated by a budget surplus or by borrowing from the public (CBO, *Federal Debt*, 3). To make payments to retirees, the fund must cash in securities. During budget deficits as we face now, borrowing from the public becomes necessary to make these payments.

As of September 30, 2010, there was only $25 million in cash assets in the military retirement fund and the cash paid to retirees during the year exceeded $50 billion (DoD Office of the Actuary, *Valuation*, 19-20). The implication is that the government exchanged nearly $50 billion in non-marketable government securities for cash in order to make the retirement payments. The trust fund balance represents a reserve of 'spending authority' for the retirement payments, but the government must still raise the cash to make the payments. The process of raising this cash is a liability to the government and can come from budget surpluses (which currently do not exist), an increase in government revenues by a corresponding tax increase, or by issuing marketable securities to the public (CBO, *Federal Debt*, 1).

Consequently, an actuarially fair lump sum payout of retirement benefits does not save the government money. The way to generate savings with a lump sum payout is to raise the discount rate. In addition, lump sum payments increase short term outlays to the government, which is likely to be viewed as cost prohibitive in the current economic environment.

2.4 Stakeholder Analysis

Stakeholders in this decision environment may be categorized in the following general terms:

- **The American public**-pays taxes, desires our national interests to be protected, takes pride in a strong military
- **Members of Congress**-would be responsible to sign a new military retirement plan into law, represent constituents, desire reelection
- **Current and former military service members**-desire adequate compensation and financial security
- **Family members of current and former military service members**-desire their loved ones to be financially secure and adequately compensated; many rely upon military retirement for their own financial security
- **Special interest groups**-want service members to be fairly compensated; tend to resist any reduction in benefits
- **Department of Defense senior leaders**-responsible for the delicate task of controlling department costs, while continuing to take care of service members

In the process of investigating the MRS, we had the opportunity to meet with and discuss the issues surrounding military retirement with leaders and professionals within DoD. We met with leaders and analysts within the Army G-8 (including the former Army G-8, LTG Lennox), the Army G-1, the Army Studies Program Management Office, the Joint Chiefs Strategy Working Group, and the Department of Defense Office of the Actuary. In addition, we were able to attend two public releases of military compensation studies, Mauren Leed's *Keeping Faith: Charting a Sustainable Path for Military Compensation* and Todd Harrison's *Rebalancing Military Compensation: An Evidence-Based Approach.* Both events engaged diverse and interested audiences in question and answer sessions. In both instances, the discussions served to expand the breadth and depth of issues formally presented. The following ideas & opinions gathered from stakeholder analysis shaped this study:

1. Military retirement is not an isolated policy issue and must be evaluated in the greater context of military compensation.
2. Opinions on the objectives of the MRS are diverse and range from taking care of military retirees to shaping the size and composition of our armed forces.
3. There are significant political and fiscal obstacles to reforming the current system.
4. Cause and effect analysis must accompany any decision to alter the MRS.
5. The MRS is expensive and potentially unsustainable.
6. The current system has outlived its intent and it is time for change.
7. The risk in our current system is borne by the US Government.
8. Congress and/or the public may not tolerate a system that transfers the risk to retiring service members.
9. A new system must seek to attract and retain high performing individuals.
10. The Military Retirement Trust Fund has very little real assets on hand.
11. Real savings in military retirements must come through the reduction of military retirement payments to military retirees.

2.5 Military Retirement System Objectives

The most significant conclusion we drew from the research and stakeholder interviews is the now deeply held view that the service member is the most important stakeholder. Each service member must decide how long to serve in the military and, while patriotism is certainly a factor, we believe current and deferred compensation is a critical element in this decision. *The Military Compensation Background Papers* (6^{th} Edition) sums this up nicely:

> *The emotional and spiritual satisfactions gained from the dedicated performance of uniformed service should be coupled with compensation sufficient for an individual member to maintain a standard of living commensurate with the carrying out of the responsibilities that directly affect the security of the nation. Without basic patriotism on the part of its members, however, there could be no Armed Forces. At the same time, in peacetime, patriotism by itself is not an*

> *adequate motivation for a service career* (DoD Undersecretary of Defense for Personnel and Readiness, 2).

This view heavily influenced our approach as we derived the following objectives that an alternative MRS must accomplish:

1. **Maximize service member control of retirement money**.
2. **Maximize transferability of retirement money to family members**.
3. **Maximize military force management capabilities**.

In spite of the research and stakeholder analysis, we consider this work to be a first iteration effort for two reasons. As previously stated, the service members' opinions of any retirement benefits package are of utmost importance; we did not solicit feedback from this critical stakeholder group. Second, we did not interview senior Department of Defense leaders who would make the decision on which alternative to present for Congressional approval. We believe this first iteration of stakeholder analysis enabled us to gain familiarity with the issues and ranges of opinions on those issues within the Department of Defense. The next step would be to interview senior leaders within DoD in order to determine the decision maker's needs, wants, desires, and constraints. This would also shape the process for conducting a market analysis in order to gain an understanding of the retirement preferences and values of those currently serving in the military. We would then link this data directly to our value modeling efforts that would enable us to develop alternatives that more precisely target service member values.

2.6 Functional Analysis

In order to develop alternatives to the current MRS that achieve the fundamental objective expressed in the problem statement, we performed functional analysis to identify and articulate what functions that any new system must perform. We believe the MRS must perform two primary functions: provide financial security to retiring service members and maintain the all-volunteer force. These functions provide a sound functional foundation and are expressed in two of three sub-principles that underlie the MRS as expressed in the *Military Compensation Background Papers* (6th Edition):

> *(2) the system should support and complement force management requirements of the active and Reserve components of the Armed Forces; and (3) the system should be integrated into the military compensation system and be structured to meet an income replacement function as well as an income maintenance function acceptable to the nation* (DoD Undersecretary of Defense for Personnel and Readiness,10).

When paired, the system functions and objectives provide a clear understanding of what the system is intended to achieve and the functions it must perform to do so and drive the next phase of problem definition, resulting in both qualitative and quantitative value models.

2.7 Value Modeling

Value modeling will provide a method to evaluate candidate solutions. There are two value models that enable this capability, the qualitative value model and the quantitative value model. The latter builds upon the former.

2.7.1 Qualitative Value Model

The qualitative value model is the most important in that it must adequately capture the elements in an alternative that bring value to stakeholders. The qualitative value model includes the fundamental objective, functions the system must perform, objectives the system must achieve, and value measures that enable us to assess achievement of system objectives. A failure, at this stage, to capture in the model appropriate measures of value will yield incrementally poor results as the project progresses. The qualitative value model is based upon the information acquired during the research and stakeholder analysis (Parnell and Trainor, 326-327). Our qualitative value model can be expressed graphically in the value hierarchy shown below. An explanation of each of the value measures follows.

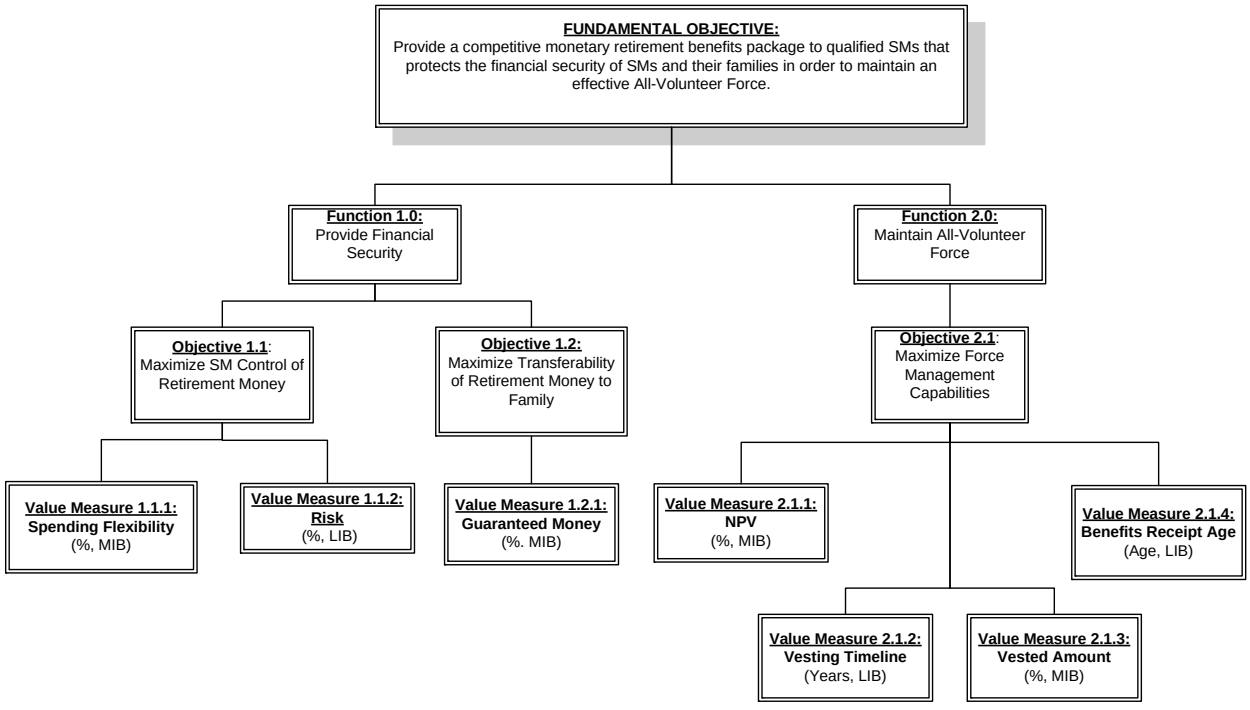


Figure 2.3 Qualitative Value Model

2.7.2 Value Measures

A value measure is a scale we use to assess how well an alternative achieves an objective. They enable us to articulate system value as we compare alternative solutions (Parnell and Trainor,

326). To better understand how they describe value in a military retirement alternative, we list the name, definition, unit of measure, and whether more or less is better.

Spending Flexibility: The maximum amount of penalty free, spendable money received in the first year of retirement, measured in percent of the current MRS net present value (NPV); more is better. This value measure addresses the issue of how much of a retiree's NPV is immediately spendable without early withdrawal penalty. Spending flexibility is the degree to which a retiree retains decision authority to make purchases with retired pay, such as the purchase of a home, education expenses, or a business start-up.

Risk: The amount of money exposed to behavioral and/or economic risk in the first year of retirement, measured in percent of the current MRS NPV; less is better. Behavioral risk is the risk of a service member losing monetary assets due to a poor financial decision, such as gambling with retirement assets. Economic risk is the risk of losing money in the financial markets, such as the loss of value in stocks and bonds. Both types of risk potentially erode the NPV of retirement assets. Risk was a commonly expressed concern among stakeholders within DoD.

Guaranteed Money: The maximum amount a service member can transfer to family members in the first year of retirement, measured in the percent of the current MRS NPV; more is better. Under the current system, only up to 55% of retired pay is transferrable to a survivor. This value measure addresses the issue of ownership and transferability of retirement assets. The more money that is guaranteed transferrable to family, the more financial security is provided.

Net Present Value: The NPV of all monetary retirement compensation for a career service member compared to what the current system provides and is measured in percent of the current MRS NPV; more is better. This expresses the value in current year (2013) dollars and is probably the most common measure of value in a retirement system.

Vesting Timeline: The earliest time a service member may be vested in defined contribution retirement money, measured in years of service; less is better. The earlier a service member is vested, the more financial security is provided.

Vested Amount: The NPV of all defined contribution and transition pay compensation for a 20 year career service member compared to the current system NPV, measured in percent of the current MRS NPV; more is better. If Vesting Timeline addresses the minimum time in service required for a service member to begin accruing retirement benefits, then Vested Amount would be the max NPV of the defined contribution and transition pay compensation possible in a twenty year career.

Benefits Receipt Age: The earliest age in which a service member can receive defined benefit retirement money, measured in years; less is better. This is different from Vesting Timeline in that it addresses the earliest time a retired service member will receive defined benefit

compensation. It focuses on defined benefit type versus defined contribution type compensation and addresses the issue of when a service member will begin to draw the benefits versus when he or she becomes qualified to receive them.

2.7.3 Quantitative Value Model

Building on the qualitative value model, we developed a quantitative value model that was used to compare each alternative we considered in the solution design phase of the Systems Decision Process. Where the qualitative value modeling process is focused on identifying what brings value to an alternative, the quantitative value modeling process enables us to measure and compare performance. The quantitative value model builds upon the qualitative value model and is comprised of the value functions, weightings, and mathematical process used to evaluate candidate solutions.

Value Functions

For each of the seven value measures in the qualitative value model, we developed a value function. A value function measures returns to scale over the range of performance for a given value measure and converts disparate units of measure into a standard unit called *value* (Trainor and Parnell, 327). For example, Spending Flexibility is the amount of retirement money that is immediately spendable measured in percent of the current MRS NPV, while Benefits Receipt Age is the earliest age a SM may receive defined benefit retirement money measured in years. It would be difficult to compare percent and age unless there is a common unit of measure. *Value* serves as the common unit of measure that enables comparison between different measurement types and scales. To determine the aggregate value of an alternative, we must develop value curves (or functions) that convert raw performance to value for each of our value measures. These value curves should reflect the value attained by the stakeholders at various levels of performance.

Our value curves are assumptions based on the experience and judgment of the analysts and the data available. In this study, we assumed the shapes of the curves based upon research and stakeholder analysis, but do not have consumer data available. We believe the value curves represented in this report to be an initial iteration of value modeling, but we desire to confirm (or update) our assumptions based upon a market analysis of currently serving military personnel. This market analysis is one of our key recommendations, and we believe it is required to better understand consumer preferences and better represent them in the value functions. Below, we include graphic representation of each value curve and explain the rationale behind our assumptions for the shape of each curve. The low end of the scale represents the minimum acceptable performance which was used as a screening criterion. This means that an alternative that provides minimally acceptable performance for a given value measure would provide zero value. The high end of the scale represents the ideal situation or the level of performance that achieves maximum value from the perspective of the stakeholder. In this case the alternative

receives a maximum value score of 100 for the given value measure. A value curve is developed for each value measure that scales raw performance between 0 and 100 in this manner.

Spending Flexibility.

In our current system, the only retirement money a retired service member can spend is one month of retirement pay at a time. We believe that as the amount of flexibility in spending retirement assets increases, value generated by the alternative also increases. As in figure 2.4 below, we assume there is a fairly steep linear return to scale up to a point, followed by a continued increase in value at a diminished rate. We believe there is an amount where a retired service member would naturally experience a decrease in desire to spend retirement money and, therefore, the returns to scale begin to diminish.

As an example of how to use this value curve, consider the case of a retirement alternative that allowed a retiree to spend, immediately upon retirement, the equivalent of 50% of the current system NPV. We can use the value curve shown below to determine the value. We accomplish this graphically by entering the x-axis in figure 2.4 at 50% and move up until we intersect the curve. We then move to the left and read the value from the y-axis. In this case, it is approximately 78.

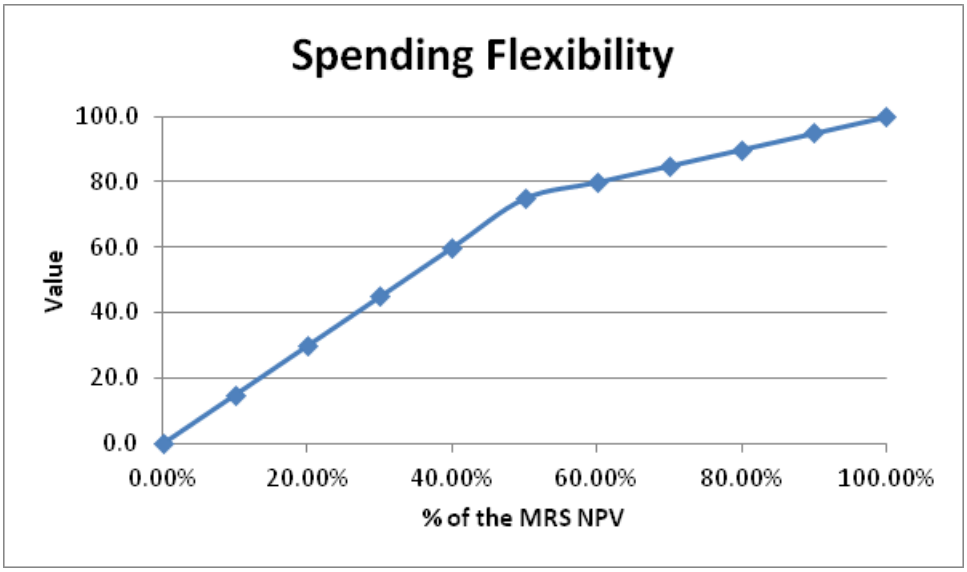


Figure 2.4 Spending Flexibility Value Function

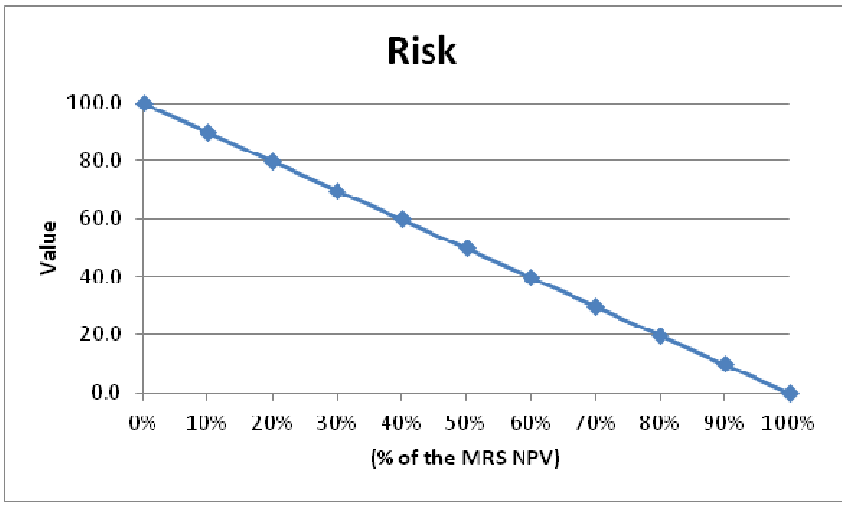


Figure 2.5 Risk Value Function

Risk. For the Risk value measure, the shape of the curve is linear decreasing, where an increase in risk decreases the value of the alternative proportionate to the amount of behavioral and economic risk present in an alternative. On the surface, it may not appear that service members would want to avoid risk, because sometimes risk is a prerequisite to reward. It is important to note the negative effect of the risk in this case, however, is a monetary loss in retirement assets. We make the assumption that most service members would not want to lose the monetary value of their retirement benefits. We consider other values in the model (Spending Flexibility and Guaranteed Money) that address issues of opportunity for retirees to spend or increase through investment the monetary value of their retirement assets. In the current system, the government bears all risk by guaranteeing and paying the monthly annuity adjusted annually for inflation.

Guaranteed Money. For the Guaranteed Money value measure, the value function increases linearly, where value to the service member increases in proportion to the amount of guaranteed money an alternative generates. Guaranteed Money addresses the idea that an alternative should provide some level of survivor benefit. The retired service member who dies at a relatively early age, should be able to pass along some monetary value to surviving family members. In this value function, the more money a retired service member is able to pass along, the greater the value to the service member.

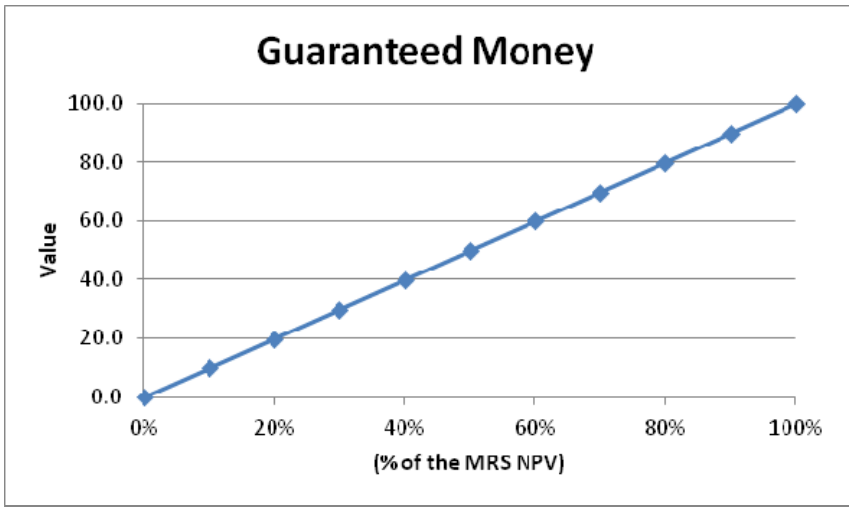


Figure 2.6 Guaranteed Money Value Function

Net Present Value. The NPV value function is depicted by an s-curve as shown in figure 2.7. We selected this s-curve based upon our interviews with stakeholders that suggest that any more than a slight reduction in NPV causes a rapid decrease in the value of a retirement system as viewed by the retiree. We believe, as shown in the curve, that a minimal reduction in NPV (compared to the current system) would yield slight decreases in value. As NPV decreases, there is a point where value begins to drop rapidly, but eventually levels off and reverts to more moderate decreases in value as NPV continues to decrease. The minimal acceptable level (minimum level on the scale) is set to 45% of the value of the current system and represents a level below which, a plan would automatically be rejected. The ideal (100%) is based on the current system.

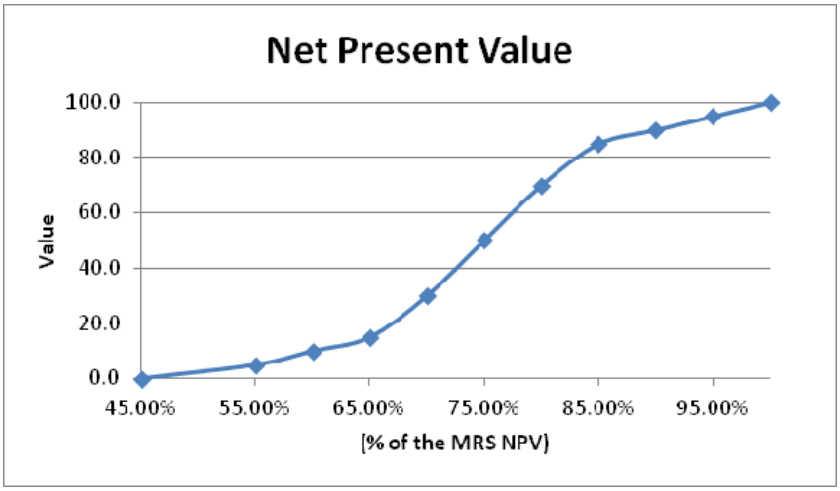


Figure 2.7 Net Present Value (NPV) Value Function

Vesting Timeline. The Vesting Timeline value function in figure 2.8 reflects a decrease in alternative value as the service time required for vesting increases. As depicted in the graph of the value function, there is a sharp drop in value after the 10 year mark. 10 years of service is significant in that this is anecdotally known by many service members as the point of no return in the current system. To serve beyond 10 years and not stay through 20 years of service to earn the retirement benefit in the current system seems, to many, to be poor decision-making. We believe that many service members desire the vesting requirements be reduced from the current 20 year requirement, but want to retain the opportunity to earn the full benefits offered in our current system.

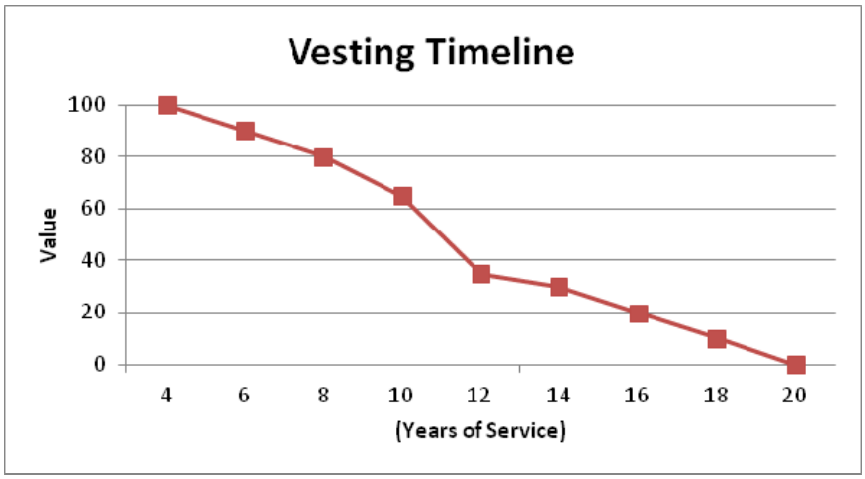


Figure 2.8 Vesting Timeline Value Function

Vested Amount. The Vested Amount value function is generally increasing. As the amount of earning potential in defined contribution monies increases, so does the value of an alternative that generates those increases. Since our current system does not offer any government payments to a defined contribution plan, any introduction of such a component would generate a sharp increase in value (unless there was a corresponding reduction in overall value). Since we currently do not have this feature, there is not a minimum acceptable level. Since we examined alternatives with defined contributions as high as 33%, we utilized this as the ideal amount that generates the most value.

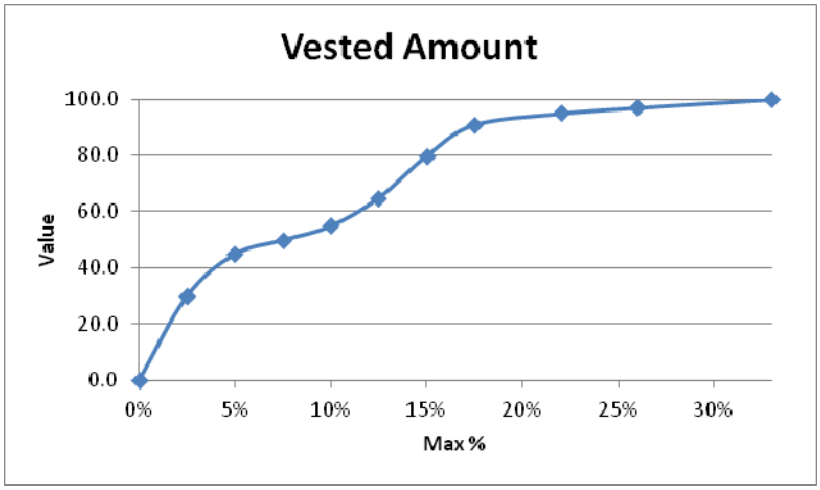


Figure 2.9 Vested Amount Value Function

Benefits Receipt Age. The final value measure, Benefits Receipt Age, is generally decreasing. In our current system, service members who enlist at the age of 17 can retire at age 37. This would equate to a service member beginning to draw benefits immediately upon retirement. We examine each alternative in terms of the minimum age to receive benefits. Alternatives we evaluated range from immediately upon retirement to age 67 and we believe that these represent the ideal and minimum acceptable levels, respectively.

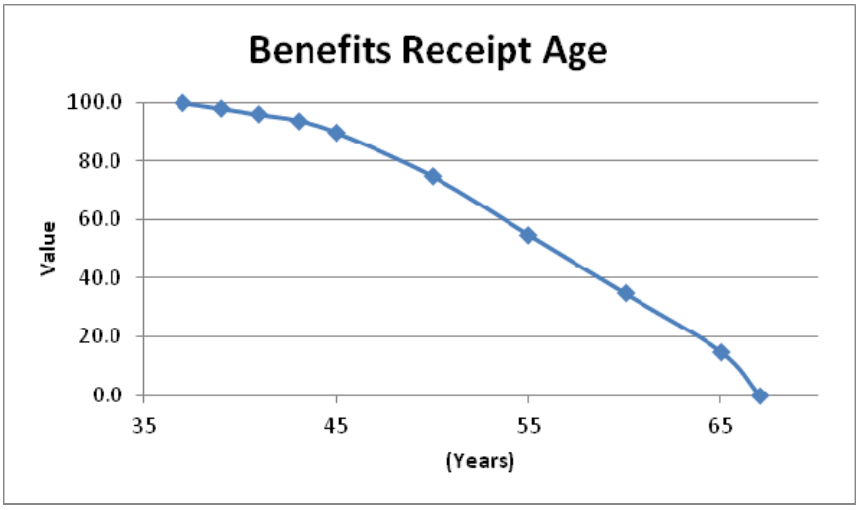


Figure 2.10 Benefits Receipt Age Value Function

2.7.4 Weighting

Weighting of our value measures is an integral part of trade-off analysis. When examining the range of value measures, it does not take long to notice there are competing features of a retirement alternative. As the saying goes, 'you cannot have it all'. We are forced to prioritize

values, and we do this through the weighting of our value measures. Additionally, the weighting assists in maintaining consistency of values through the decision making phase of the project.

We achieve this prioritization, or weighting, through the use of the aptly named swing weight matrix which is depicted and described below.

		Level of Importance of the value measure *to the decision makers and stakeholders (intuitive)*		
		High	**Medium**	**Low**
Variation in measure range ***Impact of the value measure on the decision (actual)***	**High**	NPV (100) Benefits Receipt Age (90)		Vested Amount (65) Guaranteed Money (60)
	Medium	Vesting Timeline (70)	Spending Flexibility (40) Risk (20)	
	Low			

Table 2.2 Swing Weight Matrix

The swing weight matrix is a tool that allows us to prioritize value measures and enables us to determine global or measure weights. As we consider our value measures, we must look at two aspects of each value measure we developed: the importance of the measure to the decision makers and stakeholders and the variation in measure range which addresses the impact the measure can have on the decision. First, it is important to recognize that a measure can be important and still not make a large impact on a decision. For example, arguably the single greatest measure of value for a retirement alternative is the NPV. Most would agree it is very important. If we were comparing two retirement alternatives that yielded the same NPV, then NPV would make zero impact in our decision. However, if one alternative was significantly higher in NPV than the other, that is to say, there was a high degree of variation between alternatives, NPV could make a significant impact on the decision. The swing weight matrix is simply a tool that helps the analysts and decision makers visualize both the importance and the impact a particular value measure may have on a decision.

When building a swing weight matrix, the analysts assign a priority score, or swing weight, based on the client's desires or the analysts' perception of stakeholder desires. The scale of the matrix is arbitrary. In our analysis of the MRS, we used a scale of 0 to 100, assigning the value measure with the highest importance and highest degree of variation (found in the upper left of the matrix) with a score of 100. Conversely, the value measure with the least importance and

least variation (the bottom right of the matrix) received a score of 20 relative to the value measure that we assigned a score of 100. We reiterate again here the importance of soliciting feedback from our stakeholders, in particular the decision maker and service members, to confirm our assumptions or to modify both the value measures and the swing weight matrix.

Once the swing weights are assigned, we turn these into value measure weights simply by dividing the priority score, the swing weight for a given value measure, by the sum of all of the swing weights. This is accomplished by utilizing the equation $w_i = \frac{f_i}{\sum_{i=1}^{n} f_i}$, where w_i = the value measure weight, and f_i = the non-normalized swing weight assigned to the *i* th value measure, *i* = 1 to *n*. In our swing weight matrix in table 2.2, the value measure weight for NPV would be calculated as follows: 100 (NPV swing weight)/(100+90+70+65+60+40+20) (sum of swing weights)=100/445=.225 (value measure weight). So for each alternative we examine, NPV will account for 22.5% of the total alternative value. Table 2.3 summarizes the value measures with their assigned weights.

Value Measure (VM)	Definition	Measure Scale	MIB or LIB	Swing Weight	VM Weight
Net Present Value (NPV)	The NPV of all monetary retirement compensation for a career Service Member compared to the current system	% of Current System NPV	MIB	100	22.5%
Benefits Receipt Age	Earliest Age in which a SM can receive defined-benefit retirement money	Age in Years	LIB	90	20.2%
Vesting Timeline	Earliest time a SM is vested in defined-contribution retirement money	Years of Service (YOS)	LIB	70	15.7%
Vested Amount	The NPV of all defined contribution and transition pay compensation for a career Service Member compared to current system NPV	% of Current System NPV	MIB	65	14.6%
Guaranteed Money	Max amount a SM can transfer to family in the first year of retirement	% of Current System NPV	MIB	60	13.5%
Spending Flexibility	Max amount of penalty free, spendable money in the first year of retirement	% of Current System NPV	MIB	40	9%
Risk	Amount of money exposed to behavioral and/or economic risk in the first year of retirement	% of Current System NPV	LIB	20	4.5%

Table 2.3 Value Measure, Definition, and Scale with Swing Weights and Value Measure Weights

3.0 Solution Design

Alternatives

The purpose of the alternative descriptions is to highlight the main features of each alternative to enable the reader to follow the analysis as we explain how we applied the Systems Decision Process to evaluate seven military retirement alternatives. For this analysis, we considered four existing alternatives; the current MRS, the lump sum as described by the Army QDR Office, the Defense Business Board proposal, and the 10-15-55 proposal developed by the Office of Economic Manpower Analysis. We developed three additional alternatives. Appendix B includes a cash flow diagram and table summary of each alternative.

1. **Current.** This is the current MRS as described previously in the introduction.

2. **Lump Sum.** This is an alternative military retirement system described by Tim Muchmore and Jay Moughon in their presentation, *Alternative Military Retirement System: Keeping Faith with Our Retirees & Reducing National Costs.* The lump sum alternative is a defined benefit alternative that makes a single cash payment immediately upon retirement. The cash payment is equivalent to the NPV of what the current system would pay them from date of retirement to the expected mortality age. It is assumed the cash payment could be transferred to a retirement account without incurring tax liability until money is withdrawn from the retirement account. Since the service member would own the assets and therefore could legally transfer the remaining assets to family members upon death, there is no Survivor Benefit Plan with this alternative.

3. **Modified Lump Sum (8-10).** This plan consists of a lump sum defined benefit and a government matching defined contribution component. The lump sum payment is a modification of the lump sum alternative with three key features. First, the lump sum is discounted by using an 8% discount rate to compute the value of the lump sum versus the 5.75% interest rate utilized by the DoD Office of the Actuary to evaluate the current system. Second, we added a defined contribution component that would match up to 10% of a service member's base pay. Finally, a service member would be vested in the defined contribution portion of the plan after completing 8 years of service. Under this plan, service members would receive the discounted lump sum after 20 years of service, but it would be payable immediately upon retirement and would be transferrable to family upon death. There is no Survivor Benefit Plan with this alternative.

4. **8-25-55.** This plan has a defined benefit component and government contribution component. The defined benefit component is computed in the same way our current system computes retirement, but in this plan, service members would not begin to receive monthly retirement benefits until age 55. The government contribution component includes an annual

lump sum worth 25% of base pay, payable to a service member's Thrift Savings Plan (TSP) account at the beginning of their 9th year of service and payable for every year of completed service thereafter. The money accumulating in the retirement account is retained by the service member upon separation from the military. As you can see by the 8-25-55 naming convention, **8** years to vest in government contributions, **25**% of base pay government contribution, and defined benefits payable upon reaching age **55** (OEMA's 10-15-55 proposal spawned the idea for this naming convention). There is no Survivor Benefit Plan with this alternative.

5. Defense Business Board (DBB) Proposal. This plan includes a defined contribution component, a defined benefit component, and a transition pay component. The plan, outlined in the DBB's presentation, *Modernizing the Military Retirement System* (dated July 21, 2011) includes ranges of values for key parameters, such as vesting requirements and matching amounts. The DBB included ranges to allow for flexibility in shaping the force, but this also impacts the costing of the plan. For example, the DBB plan would vest service members after 3 to 5 years of service in the defined contribution portion, payable at age 60 to 65 (or social security age). The defined contribution portion also includes features such as: partial withdrawals for education, healthcare, or other qualified expenses and adjustments to recognize combat roles, family separation, and other duties. The defined benefit portion would be computed based upon a high 5 formula (average of the highest five years of base pay). This high 5 base pay calculation would be multiplied by 2.0 (not the 2.5 multiplier in our current system) for each year of service. For example, under our current system a retiring service member receives the high 3 base pay multiplied by 2.5 multiplied by years of service. Under the DBB plan, this is reduced to high 5 base pay multiplied by 2.0 multiplied by years of service. As an example, a service member, who retires at 20 years of service, would receive 40% of the average of the highest five years of base pay under the DBB proposal versus 50% of the average of the highest three years of base pay under our current system. This plan also delays receipt of defined benefit monthly retirement payments from immediately upon retirement to age 67. This plan also includes a transition pay equal to one month of base pay for each year served (Defense Business Board, 12-13, 18). There is no Survivor Benefit Plan with this alternative.

6. 10-15-55. This plan, developed by OEMA, includes defined contribution, defined benefit, and transition pay components. The government will contribute 5% of every service members base pay to a retirement account (presumably a TSP account). The government will also match a service member's contribution up to 5%, so a service member can accumulate up to 15% of his or her base pay per month (5% government contribution, 5% personal contribution, and 5% government match). A service member always retains his or her own contributions and is vested in the government contributions as early as 10 years of service. At 10 years of service, the service member retains all of his or her own contributions and 50% of the government contributions. For each additional year of service, the service member retains an additional 10% of the government's contributions which means that at 15 years of service, a service member is

fully vested in the defined contribution component. The defined benefit component is an annuity payable monthly to Service Members with at least 20 years of service, and it is computed in the same manner as the current system. This plan delays, however, the receipt of the annuity until a service member reaches age 55. The final component is transition pay, which is computed as the highest 6 months of base pay and is only payable to those who qualify for the annuity. There is no Survivor Benefit Plan with this alternative (Lyle and Smith, 6-9).

7. ORCEN Hybrid. This plan is a hybrid of a lump sum, traditional annuity, and defined contribution plan. Under this plan, a retiring Service member would receive a lump sum payment immediately upon retirement. The lump sum would be discounted using a higher discount rate (8% versus the 5.75% utilized by the DoD Office of the Actuary in the annual MRS valuation) and computed for the time frame immediately following retirement until a service member reaches age 67. After reaching age 67, the service member would begin to receive an annuity computed using the current system formula. The vesting requirement for the lump sum and annuity is 20 years of service. The final component of this plan includes a government match to a TSP retirement account of up to 5% of a service member's base pay. The service member would be vested in this benefit after 8 years of service. A service member would retain all government contributions upon leaving the military with at least 8 completed years of service. The lump sum could be passed to surviving family members in the event a service member died prior to age 67. The annuity would stop immediately upon a retired service member's death. There is no Survivor Benefit Plan with this alternative.

The table below summarizes the seven alternatives considered in this study.

Alternative	Defined Contribution	Defined Benefit	Transition Pay	Vesting	Defined Benefit Receipt Timeline
Current	None	Annuity	None	20 YOS	Immediate
Lump Sum	None	Lump Sum	None	20 YOS	Immediate
Modified LS (8-10)	10% Base Pay (Match)	Lump Sum (discounted)	None	8 YOS-DC 20 YOS-DB	Immediate
8-25-55	25% Base Pay (Gate Pay)	Annuity	None	8 YOS-DC 20 YOS-DB	Age 55
Defense Business Board	4-12% Base Pay (Contribution*)	Annuity	Monthly base pay multiplied by years of service	3-5 YOS-DC* 20 YOS-DB	Age 67
10-15-55	5% Base Pay (Contribution) 5% Base Pay (Match)	Annuity	Highest 6 months of base pay	10 YOS-DC* 20 YOS-DB	Age 55
ORCEN Hybrid	5% Base Pay Match	Lump Sum (discounted) & Annuity	None	8 YOS-DC 20 YOS-DB	Immediate (Lump Sum) Age 67 (Annuity)

Table 3.1 Summary of Retirement Alternatives

4.0 Decision Making

We begin this phase with a discussion of our costing model and the alternative scoring methodology. We then demonstrate the trade-off analysis methodology, where we compare the value an alternative generates to its cost. We express this in terms of both long range costs and short-term liabilities. Additionally, we breakout the trade-offs by value measure and show how each alternative performs along each value measure. We conclude this phase by examining the sensitivity of our model to the swing weights we assigned to our value measures.

4.1 Economic Assumptions

We include the following economic assumptions, which we based upon the *Valuation of the Military Retirement System, September 30, 2010* (DoD Office of the Actuary).

- All calculations are in 2013 dollars (projected forward then brought back to 2013)
- Long term interest rate: 5.75%
- Long term real interest rate: 2.75% (interest rate minus inflation)
- Long term inflation rate: 3.0%
- Long term salary increases: 3.75%
- Mortality: Officers, Age 86 and Non-Commissioned Officers, Age 81 (based upon improved mortality)

4.2 Cost Estimation Model

Central to an analytical comparison of seven military retirement alternatives is a robust net present value analysis. To conduct this analysis, we utilized @Risk by Palisade Corporation to build a Monte Carlo simulation model. We focused our analysis on Army active duty, non-disabled retirements and examined the O5 and E7 ranks, which comprised 44% of the active duty non-disabled Soldiers who retired in FY2010 (DoD Office of the Actuary, *Statistical Report on the Military Retirement System: Fiscal Year 2010*, 82). We projected cash flows in each of three retirement components forward from year 2013, where the first 20 year retirement would occur at the beginning of 2033. Figure 4.1 diagrams the three components of our cost estimation model with inputs and outputs. We estimated costs for these three elements (defined benefit payments, defined contribution payments, and transition payments), and then aggregated these costs across the estimated Army O5 and E7 active duty non-disabled retirement populations. Through simulation, we arrive at an estimated cost for each alternative for all eleven years of service levels (20-30 years) and subsequently computed an aggregated cost for each grade considered (Army active duty, non-disabled O5 and E7). In conducting our simulation, we did convergence testing and determined that 50,000 iterations was sufficient to achieve results within 1% of the actual mean with 99% confidence.

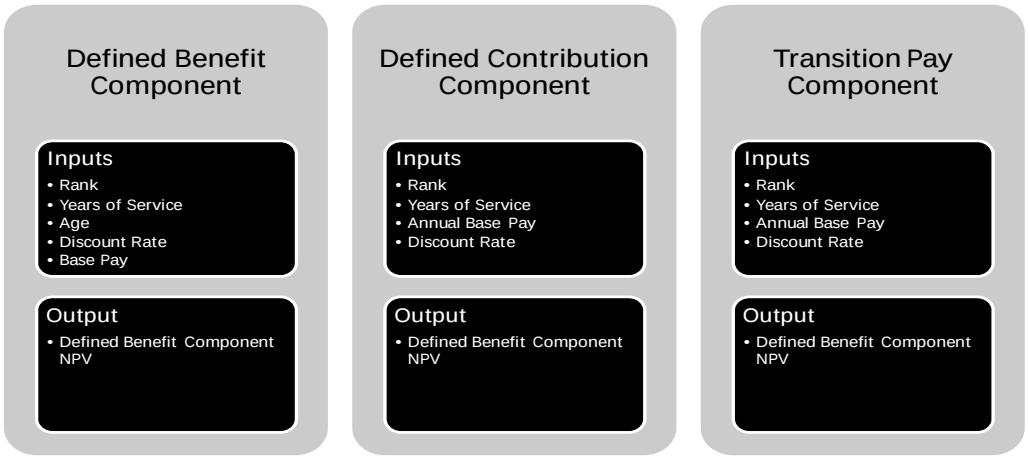


Figure 4.1 Components, Inputs, and Outputs of the Cost Estimation Model

4.2.1 Defined Benefit Component

For the defined benefit Monte Carlo simulation, we had to project the cash flows of a retiring O5 and E7. Assuming a new alternative could be implemented for a cohort entering service in 2013, the earliest full retirement date would be the beginning of 2033. However, we expressed the costs and present value figures in 2013 dollars.

The model was designed to run eleven simulations, one for each level of years of service, 20 to 30. To model the age of retiring service members, we created a discrete distribution from 10 years of actual retirement data (provided by the Defense Manpower Data Center) to replicate the probability of a service member retiring at each grade for a specific age and years of service pairing. For each iteration, the simulation randomly drew an age from the unique distribution representing each grade and number of years of service. Since retiring O5s can be different ages at retirement and the present value of defined benefits are dependent upon the age of the service member (among other variables), it was important to capture this uncertainty in the model. The output of this computation was an average net present value for each grade and years of service pairing. For example, we arrived at an expected net present value for an O5 with 20 through 30 years of service. We multiplied the expected net present value by the forecasted (10 year average) number of retirees to arrive at a cost estimate for each level of years of service. Table 4.1 depicts this methodology for the current system. Summing the aggregate cost column yields an estimated aggregate cost of $1.03B for the current system for O5 Army active duty, non-disabled retirements.

YOS	AVG NPV	Forecasted Strength	Aggregate Cost
20	$802K	356	$285M
21	$879K	193	$170M
22	$944K	168	$158M
23	$1.05M	99	$103M
24	$1.12M	76	$85M
25	$1.27M	52	$66M
26	$1.27M	39	$49M
27	$1.35M	26	$35M
28	$1.44M	34	$49M
29	$1.52M	9	$13M
30	$1.59M	8	$13M

Table 4.1 Current System Defined Benefit Computations for Retiring O5s

This model could be expanded to include additional areas of uncertainty as well as additional ranks, services, and retirement categories. Additional data collection and modeling would be required.

4.2.2 Defined Contributions

We estimated the defined contribution costs by adding the cost of those who leave service prior to a full 20 year military retirement to the costs of those serving at least 20 years. To do so, we constructed a "typical" officer and enlisted career timeline using Army career timeline estimates based on DA PAM 600-3 (page 35) and DA G-1 historical selection rates. The defined contribution calculation is age independent and entails computing the net present value of defined contributions based upon years of service and the number of years of government matching or outright contributions. The career timeline estimated promotion pay increases and longevity pay increases that were integral to the defined contribution retired pay estimates. We did not include a service member's own contributions in the estimates of cost, but assumed that service members would contribute the maximum for plans that include government matching.

We used the career timeline to project the future value of annual government contributions toward each plan. Similar to the defined contribution component, we projected annual salaries in accordance with the estimated career timelines beginning in year 2013 with the full 20 year retirement occurring at the beginning of 2033. We then brought back each of these annual cash flows to year 2013 and multiplied by the government matching or contribution percentage called for by each alternative to estimate the government contribution. For each year, we added up the current year and previous years of government contributions. Figure 4.2 demonstrates this

calculation for an E7 retiring with 20 years of service under the DBB plan, which calls for a 12% government contribution.

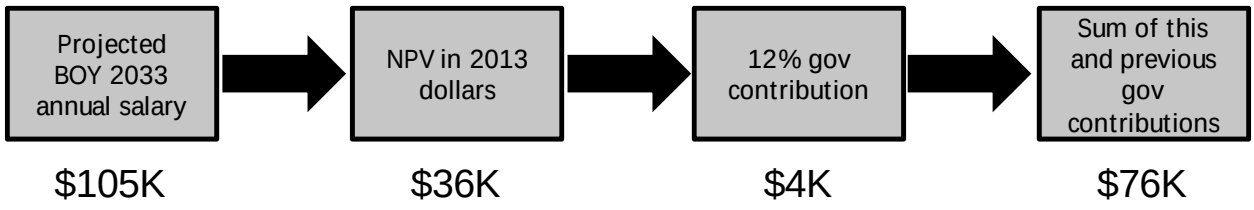


Figure 4.2 DBB Plan Defined Contribution Calculation for an E7 Retiring with 20 YOS

To aggregate the defined contribution component for career officers and NCOs, we multiply the cumulative government contributions by the forecasted officer and enlisted strength. This covers the careerists, but there are still costs associated with those who do not make the military a career, but do qualify for matching contributions under some retirement alternatives.

To estimate this portion of the cost of defined contributions, we used retention data provided by the Defense Manpower Data Center (FY2001-FY2010) to estimate the number of officers and enlisted who serve less than 20 years who would receive matching contributions in a TSP type retirement account. We used the 10 year average number of service departures for each 'years of service' level to compute the total defined benefit costs of non-careerists. We then used a proportionality factor based on the 10 years of historical data to attribute a portion of the cost of officer and enlisted defined contributions to the O5 and E7 grades (under 20 years of service). We assigned 46% of the cost of non-careerist officer government contributions to the O5 and 49% of the cost of non-careerist enlisted government contributions to the E7.

4.2.3 Transition Pay

Only two of the seven alternatives we considered have a transition pay component, the DBB proposal and OEMA's 10-15-55 plan. The calculations for transition pay are similar to the defined contribution component in that they are contingent upon a projected annual salary based on the estimated career timeline. For the DBB plan, transition pay is computed as the years of service multiplied by the projected final basic pay. Those who served 3-5 years (at least 4 years of service for our calculations) were eligible for transition pay. We utilized the same projected retention as described above and ascribed 46% and 49% of the cost of transition pay under the DBB plan to the O5 and E7 grades respectively.

The 10-15-55 plan calls for the highest 6 months of base pay, but only for those serving at least 20 years. This estimate is simply a matter of multiplying the projected final month of basic pay by six months and aggregating by the forecasted personnel strength numbers utilized in the other two component cost estimates.

4.2.4 Cost Estimation Summary

We estimated the cost of each retirement alternative by estimating the cost of careerists, those serving 20 to 30 years. This figure includes an estimate for three retirement pay components, defined benefit, defined contribution, and transition pay. We then added the estimated costs for transition pay and defined contribution pays for non-careerists to arrive at our total cost estimate. We conclude this section with a chart (Table 4.2) that summarizes the NPV of each alternative for both the O5 and E7 with 20 years of service. As described above, these figures are projected out to 2033 then expressed in 2013 dollars.

20 Years of Service	Current	Lump Sum	Modified LS (8-10)	8-25-55	DBB	10-15-55	ORCEN Hybrid
 O-5	$802K	$802K	$688K	$727K	$465K	$682K	$761K
 E-7	$410K	$410K	$261K	$338K	$217K	$313K	$379K

Table 4.2 NPV Comparison for an O5 and E7 with 20 Years of Service

4.3 Value Scoring and the Mechanics of Generating Value

To score alternatives, we utilized an additive value model, where total alternative value V(x) is a function of the weight of each value measure multiplied by the raw value generated by a particular value measure:

$$V(x) = \sum_{i=1}^{n} w_i \, v_i(x_i)$$

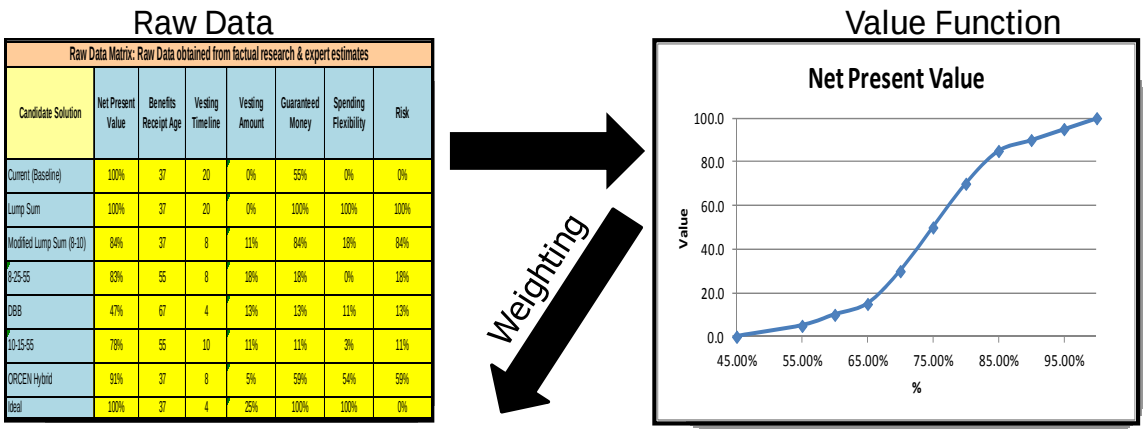
$V(x)$ = total alternative value
w_i = value measure weight (normalized swing weight, where $\sum_{i=1}^{n} w_i = 1$)
$v_i(x_i)$ = single dimensional value of the alternative on the *i* th value measure

Table 4.3 highlights the value measures, the swing weights, and the value measure weights used in the weighting process.

Value Measure (VM)	Definition	Measure Scale	MIB or LIB	Swing Weight	VM Weight
Net Present Value (NPV)	The NPV of all monetary retirement compensation for a career Service Member compared to the current system	% of Current System NPV	MIB	100	22.5%
Benefits Receipt Age	Earliest Age in which a SM can receive defined-benefit retirement money	Age in Years	LIB	90	20.2%
Vesting Timeline	Earliest time a SM is vested in defined-contribution retirement money	Years of Service (YOS)	LIB	70	15.7%
Vested Amount	The NPV of all defined contribution and transition pay compensation for a career Service Member compared to current system NPV	% of Current System NPV	MIB	65	14.6%
Guaranteed Money	Max amount a SM can transfer to family in the first year of retirement	% of Current System NPV	MIB	60	13.5%
Spending Flexibility	Max amount of penalty free, spendable money in the first year of retirement	% of Current System NPV	MIB	40	9%
Risk	Amount of money exposed to behavioral and/or economic risk in the first year of retirement	% of Current System NPV	LIB	20	4.5%

Table 4.3 Value Measure, Definition, and Scale with Swing Weights and Value Measure Weights

The additive value model is a mathematical representation of the weighting process we utilized to quantify total value in each alternative. As discussed in the problem definition section, we developed the qualitative value model which outlines the value measures and is oriented on areas where an alternative generates value. We built upon this by developing the quantitative value model, in which we determined the value curves/functions for each value measure to convert raw performance data into value. As figure 4.3 demonstrates, raw data is converted to value via the value function. The value function in the figure is for Net Present Value. The current system generates a NPV of 100% of the current system NPV and when we enter the x-axis at 100%, the corresponding y-axis value according to the curve is a value score of 100. From our swing weight discussion in section 2.7.4 and table 4.3 above, we know that the value measure weight for NPV is 22.5%. As per the additive value model, we multiplied the value measure weight for each value measure (22.5% for NPV) together with the value score determined by the value function (100 for NPV) to arrive at 22.5 value points. We did this for each value measure using its corresponding value function and weight then summed them for a total value score for each alternative. The Total Value column circled in red in the bottom chart of the graphic displays the total weighted value scores for each alternative. The ideal alternative represents the max value score possible from each of the value measures. Although this is not attainable, it does enable us to visualize the weighting of each value measure at its ideal level.



Raw Data Matrix: Raw Data obtained from factual research & expert estimates

Candidate Solution	Net Present Value	Benefits Receipt Age	Vesting Timeline	Vesting Amount	Guaranteed Money	Spending Flexibility	Risk
Current (Baseline)	100%	37	20	0%	55%	0%	0%
Lump Sum	100%	37	20	0%	100%	100%	100%
Modified Lump Sum (8-10)	84%	37	8	11%	84%	18%	84%
8-25-55	83%	55	8	18%	18%	0%	18%
DBB	47%	67	4	13%	13%	11%	13%
10-15-55	78%	55	10	11%	11%	3%	11%
ORCEN Hybrid	91%	37	8	5%	59%	54%	59%
Ideal	100%	37	4	25%	100%	100%	0%

Total Value Score: Computes Total Value for each Alternative

Candidate Solution	Net Present Value	Benefits Receipt Age	Vesting Timeline	Vested Amount	Guaranteed Money	Spending Flexibility	Risk	Total Value
Current (Baseline)	22.5	20.2	0.0	0.0	7.4	0.0	4.5	**54.6**
Lump Sum	22.5	20.2	0.0	0.0	13.5	9.0	0.0	**65.2**
Modified Lump Sum (8-10)	19.5	20.2	12.6	11.3	11.7	2.4	0.0	**77.8**
8-25-55	20.2	11.1	12.6	14.1	3.4	0.0	3.4	**64.8**
DBB	1.3	0.0	15.7	14.6	4.3	2.0	3.1	**41.0**
10-15-55	18.0	11.1	10.2	13.4	2.5	0.6	3.7	**59.6**
ORCEN Hybrid	21.2	20.2	12.6	7.2	8.4	7.0	1.7	**78.3**
Ideal	22.5	20.2	15.7	14.6	13.5	9.0	4.5	**100.0**

Figure 4.3 Mechanics of Calculating Value

4.4 Results (Trade-offs)

Figure 4.4 displays the total value of the alternative from 0-100 on the y-axis and the percent of current system cost on the x-axis. It is important to note that the current system, Lump Sum, and 8-25-55 alternatives (in the red box) cost more and generate less value than at least one other alternative. In particular, we say the ORCEN Hybrid and Modified Lump Sum alternatives dominate the current system and Lump Sum alternative, and the Modified Lump Sum dominates the 8-25-55 alternative. The alternatives along the blue curved line are known as the efficient frontier. None of these alternatives is dominated by another.

The alternative that generates the highest value is the ORCEN Hybrid. It also has one of the highest costs in generating that value. At the low end of the spectrum is the DBB proposal that generates the lowest value, but also at the lowest cost. Given these alternatives on the efficient frontier, the question then is how much value is the government willing to purchase? This question is not easily answered and, as discussed earlier, some additional analysis is warranted to determine how closely service members' values are reflected in the value measures (and their respective value curves and value measure weights) expressed in this work.

It is also important to note that any of the alternatives could be incrementally reduced in value along a particular value measure, which would result in a corresponding cost reduction. For example, if DoD leadership wanted to retain the lump sum feature of an alternative such as the

ORCEN Hybrid, we could increase the discount rate, which would reduce the lump sum component net present value and overall alternative cost. While this would reduce the overall value of the alternative in the eyes of the service member, it may bring the costs closer in line with desired levels of savings sought by the military.

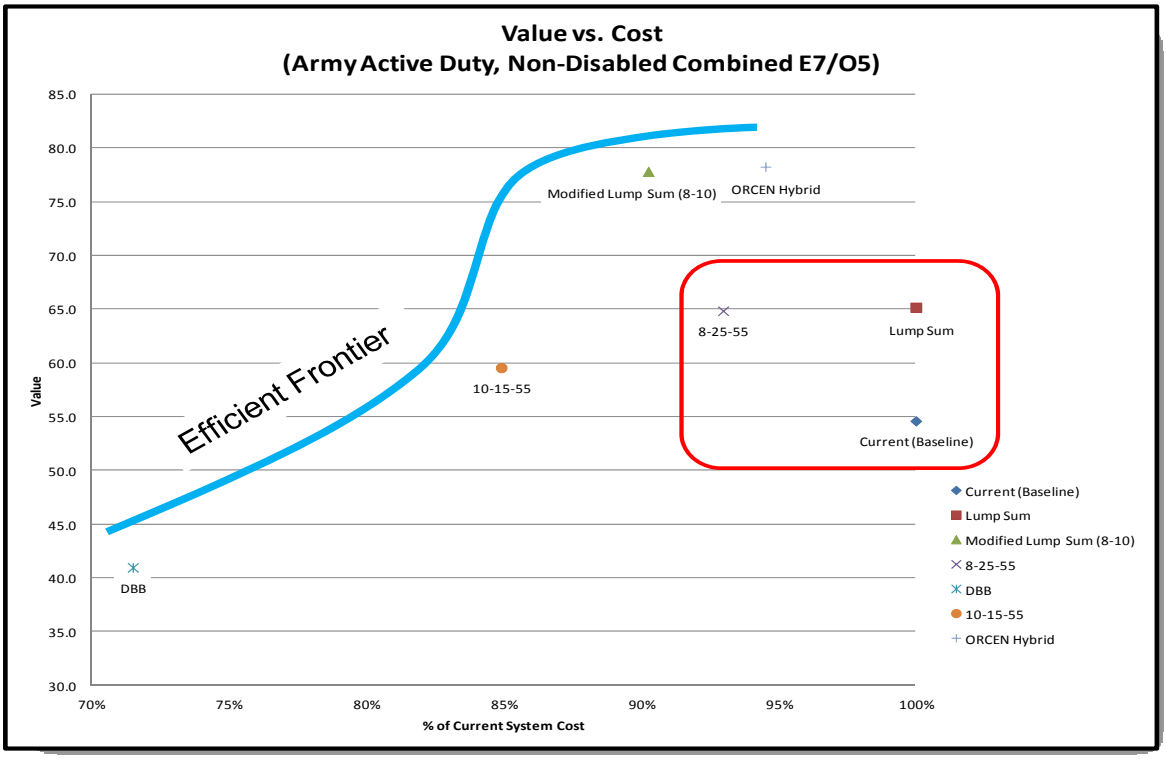


Figure 4.4 Value Versus Cost

A second and equally important and relevant aspect to consider, especially when considering large cash payments (lump sums), is the alternative's value versus the short-term liabilities. The short-term liabilities are expressed in terms of the percent of the current system cost in figure 4.5. The three alternatives with the lump sum components are high in value, but also high in short-term costs. The current system, 10-15-55, and 8-25-55 (in the red box) are lower in value, but also significantly lower in short-term costs. The DBB alternative falls in the middle of these two polarized groups and has a fairly significant up-front cost primarily due to the large portable transition payments (one month of base pay for each year of military service) and retirement account contributions.

DoD decision makers must consider short-term costs due to the national focus on reducing budget deficits. Given the current economic environment, it would be extremely difficult to pass a significant short-term increase in retirement expenditures, even if there were savings to be gained in the long run.

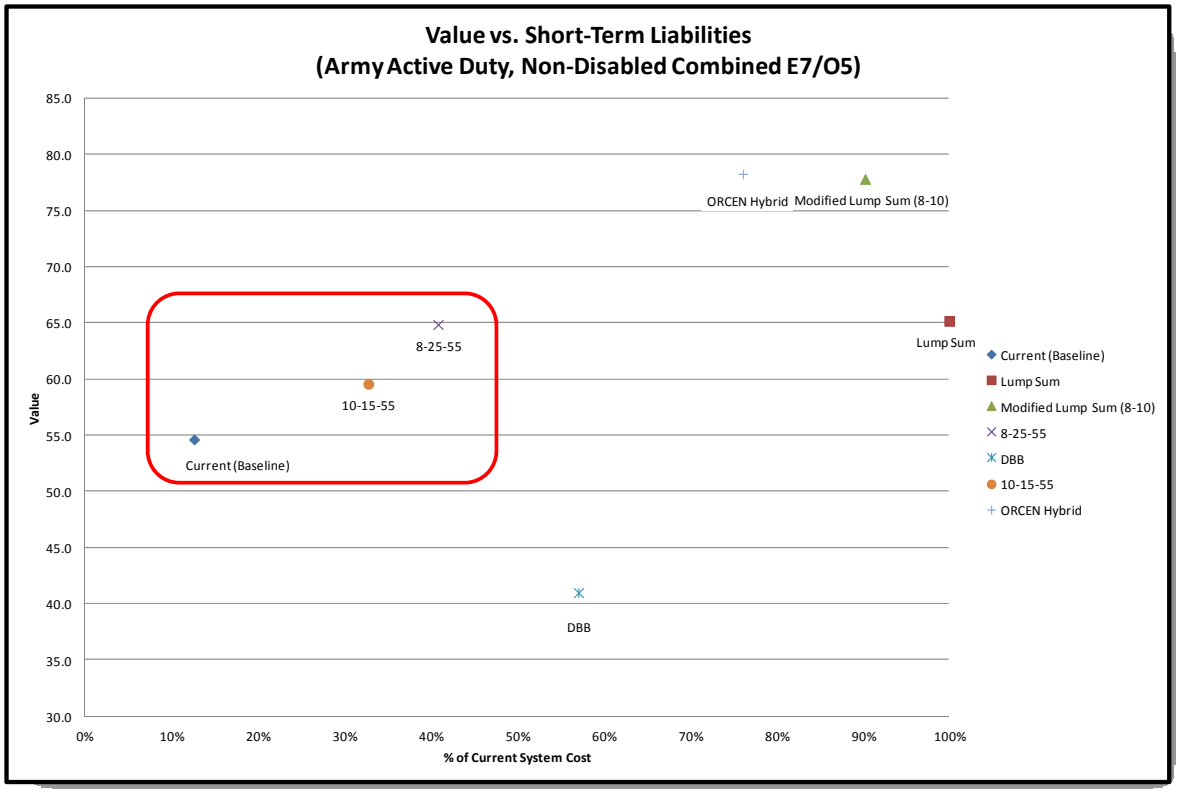


Figure 4.5 Value Versus Short-Term Liabilities

4.5 Additional Tradeoffs

Another area of tradeoff analysis for consideration is the component value earned by each alternative along each value measure. This analysis, which is shown graphically in figure 4.6, allows decision makers to visualize the performance of each alternative at the value measure level. Each color band in the bar chart represents the contribution of performance by the alternative along each of the value measures to the total value earned by each alternative with the total value at the top if each stacked bar. Given this visual display of value, some observations quickly stand out such as an alternative that generates minimal value for a particular value measure. For example, the DBB alternative generates minimal value in the Benefits Receipt Age value measure. This, of course, is due to the delay until age 67 in retirees receiving the retirement annuity. Similarly, the current system and the Lump Sum do not vest until 20 years of service, which generates a corresponding minimal value along the Vesting Timeline value measure. Since there is no defined benefit component to either alternative, they also generate minimal value along the Vested Amount value measure. By contrast, the Lump Sum and Modified Lump Sum are strong performers in the Guaranteed Money value measure due to the portability of the lump sum component of each alternative. Finally, we observe the current

system scores well in the Risk category as the government bears most of the financial risk and mitigates the behavioral risk by paying benefits on a monthly basis.

This view can be helpful in looking for improvements to alternatives. As mentioned previously, if there is a particular feature of an alternative that decision makers want to strengthen this value-focused view can be quite useful. Alternatively, if a decision maker desires to reduce cost, this analysis can assist in selecting the best way to preserve value while reducing cost.

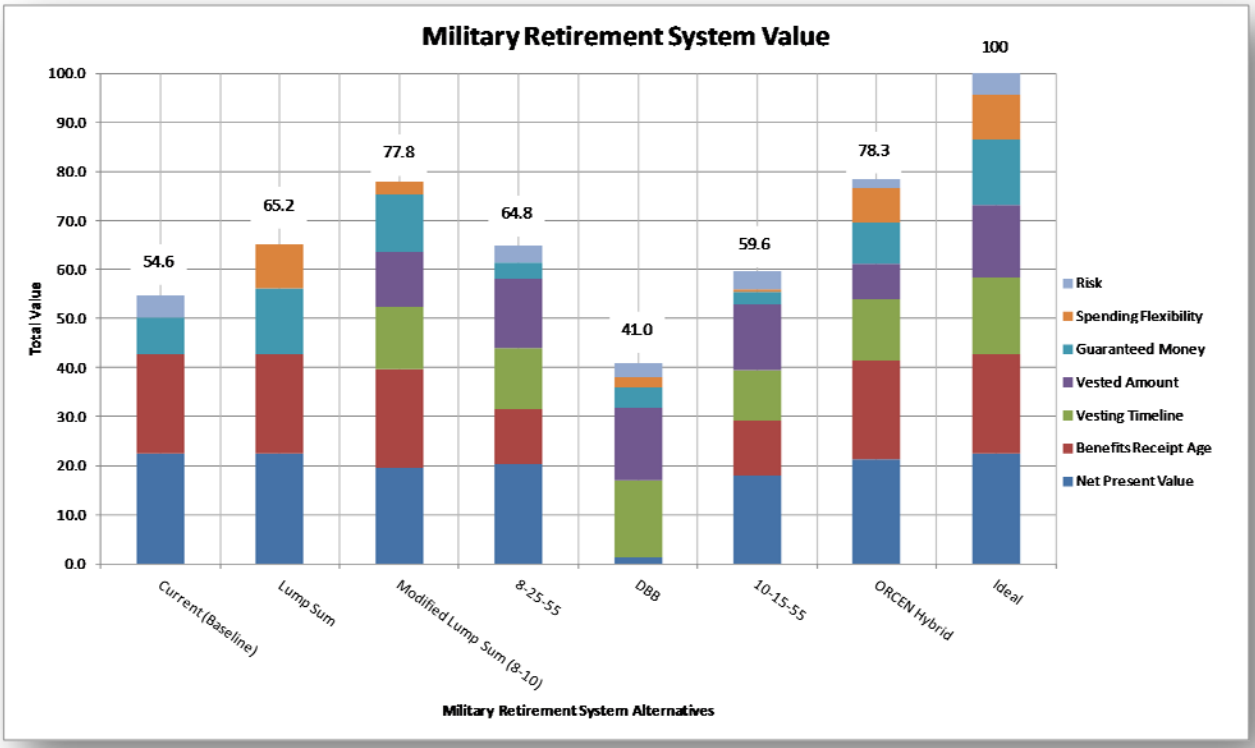


Figure 4.6 Military Retirement System Value

4.6 Sensitivity Analysis

We conducted sensitivity analysis on the relative importance, specifically the weights, of each value measure. We accomplished this by varying the swing weights of each value measure, from 0 to 100, while holding all others at their original swing weight. We used data tables in Microsoft Excel to carry out the weighting recalculations and plotted graphs of the total values for each of the alternatives to see the effect that value measure weights have on the total system value. This allows us to see the sensitivity of our preferred alternatives to the relative importance of our value measures. We conducted this sensitivity analysis for each value measure.

As an example, in the NPV sensitivity graph below in figure 4.7, the total value score is along the y-axis with the swing weight along the x-axis. At a swing weight of 100, the ORCEN Hybrid scores only slightly better than the Modified Lump Sum. However, as we decrease the swing weight from 100 to 0, the Modified Lump Sum jumps in the sorting order and incrementally edges out the ORCEN Hybrid in total value. There is a significant gap between the top two alternatives and the other five. The top two alternatives generally hold their sorting order through varying the swing weights of all value measures with some cross over between these two. Occasionally, the other alternatives cross over at the extreme swing weight values in the other six value measures. As we can see from this analysis, the value curves and the swing weights matter, which is why we recommended further analysis into service member preferences.

See Appendix C for sensitivity graphs for each value measure.

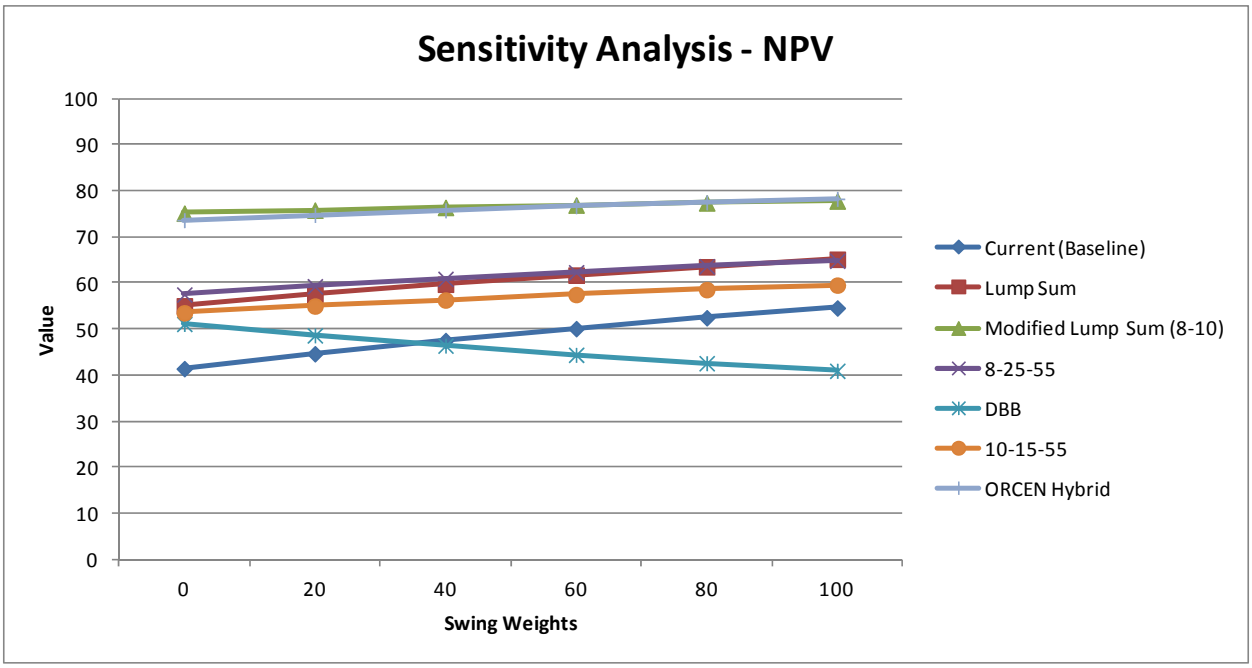


Figure 4.7 NPV Swing Weight Sensitivity Analysis

5.0 Summary and Recommendations

Changing the military retirement system is a monumental task. It is a particularly challenging feat at this juncture in our nation's history given the global economic turbulence, the protracted combat deployments of American troops, and the budgetary pressures to reduce deficits. When you add the large network of stakeholders from the American public to interest groups to current and former service members and their families to lawmakers and other government officials, the issue becomes even more complex. We do not believe it is possible to make everyone happy with a new system.

In this work, we identified the primary objective of the retirement system, which we believe is some combination of providing financial security to retired service members and providing an incentive for quality individuals to fill critical roles in America's all-volunteer military. Utilizing the SDP methodology, a systems engineering approach to decision making, we developed a model to quantify the value in military retirement alternatives. This enabled us to compare alternatives in terms of the value each generates, estimate the costs of each, and perform the cost versus value trade-off analysis that we believe is critical to any decision to alter the current system. While this model is not without flaws, it can be strengthened with additional research. We believe it demonstrates a capable methodology while highlighting the importance of quantifying retirement alternatives in terms of the value they bring.

Moving forward, we believe an in-depth market analysis is warranted to determine what service members' value in an alternative. As of this writing, we have a cadet systems engineering team developing a survey instrument utilizing a conjoint analysis solution to conduct a pilot market analysis of the local West Point population. We believe it is critical to hone in on service member values when it comes to military retirement. We hope the pilot market analysis demonstrates the capability to move from the assumptions we had to make regarding service member values and the associated value functions in the current value model toward a more informed representation.

We believe, as demonstrated in the value modeling we have conducted, there are factors other than net present value that are important to service members. The timing and magnitude of retirement cash flows matter in addition to the overall net present value of the retirement plan. Although, we did not make a specific recommendation, we do believe there is merit in the (discounted) lump sum concept, particularly in a hybrid system that includes a lump sum and traditional annuity payments. The lump sum can be discounted to generate savings for the military and the annuity payments can provide added security in a retiree's later years. We believe the lump sum is attractive to service members and can be instrumental in reducing costs while preserving value.

We recommend an evaluation framework underpin any decision to change the current system. While there has been much written to describe alternatives to the current system, we have not

discovered a quantitative framework to evaluate and compare multiple alternatives. We believe a DoD approved quantitative value model is possible with further research into service member preferences, additional stakeholder analysis focused specifically on value measures and functions, and senior leader input.

Finally, we recognize that military retirement is but a single component of the greater issue of military compensation. Military compensation and retirement, in particular, will continue to be on the reduction table. Future generations require that we evaluate this issue holistically and with an eye for preserving the value of the system. While this issue is complex, value-focused thinking and the Systems Decision Process can assist decision makers in capturing the important trade-offs that will help navigate these turbulent times.

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Appendix A: List of Abbreviations

COLA-Cost of living adjustment

CSB-Career Status Bonus

DoD-Department of Defense

MRS-Military retirement system

NPV-Net present value

QDR-Quadrennial Defense Review

SBP-Survivor Benefits Plan

SDP-Systems Decision Process

TSP-Thrift Savings Plan

YOS-Years of service

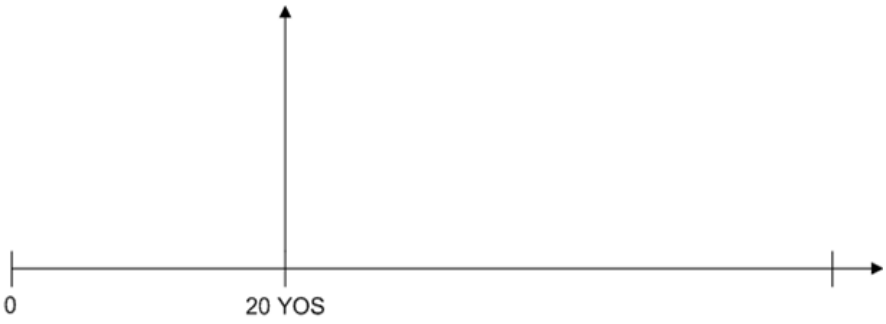
Appendix B: Retirement Alternatives-Cash Flows and Overview

Green represents defined benefit retirement money and blue represents defined contribution money.

Current System

Vesting	20 YOS
Defined Contribution	None
Defined Benefit	2.5% * YOS * High-3
DB Payout Method	Annuity
Transition Pay	None
Transferability	55% (Survivor Benefits Plan)

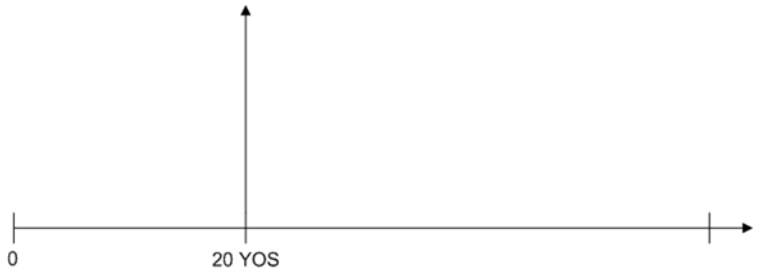
Lump Sum



Vesting	20 YOS
Defined Contribution	None
Defined Benefit	2.5% * YOS * High-3
DB Payout Method	Lump Sum (Immediate)
Transition Pay	None
Transferability	100%

Appendix B: Retirement Alternatives-Cash Flows and Overview

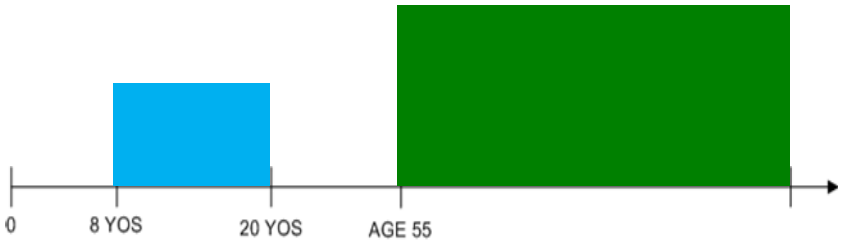
Modified Lump Sum (8-10)



Vesting	8 YOS (DC); 20 YOS (DB)
Defined Contribution	10% Base Pay Match (Paid Monthly)
Defined Benefit	2.5% * YOS * High-3
DB Payout Method	Discounted Lump Sum* (Immediate)
Transition Pay	None
Transferability	100%

*25% of the lump sum may be spent immediately on a qualified purchase

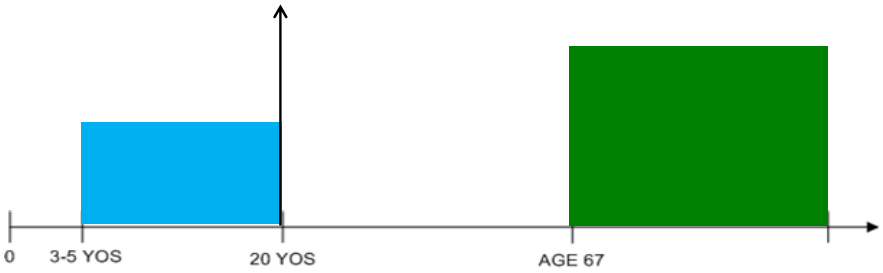
8-25-55



Vesting	8 YOS (DC); 20 YOS (DB)
Defined Contribution	25% Base Pay (Annual Lump Sum)
Defined Benefit	2.5% * YOS * High-3
DB Payout Method	Annuity (Age 55)
Transition Pay	None
Transferability	100% DC

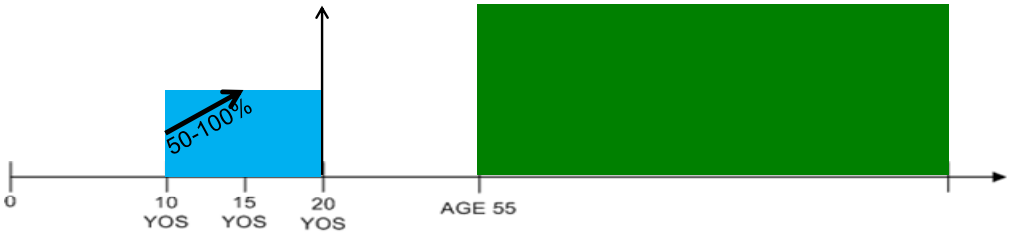
Appendix B: Retirement Alternatives-Cash Flows and Overview

Defense Business Board Proposal



Vesting	3-5 YOS (DC); 20 YOS (DB)
Defined Contribution	4-12% Base Pay (Paid Monthly)
Defined Benefit	2.0% * YOS * High-5
DB Payout Method	Annuity (Age 67)
Transition Pay	1 Month Base Pay * YOS
Transferability	100% DC

10-15-55



Vesting	10-15 YOS* (DC); 20 YOS (DB)
Defined Contribution	5% Base Pay; 5% Base Pay Match (Both Paid Monthly)
Defined Benefit	2.5% * YOS * High-3
DB Payout Method	Annuity (Age 55)
Transition Pay	Highest 6 Months Pay
Transferability	100% DB

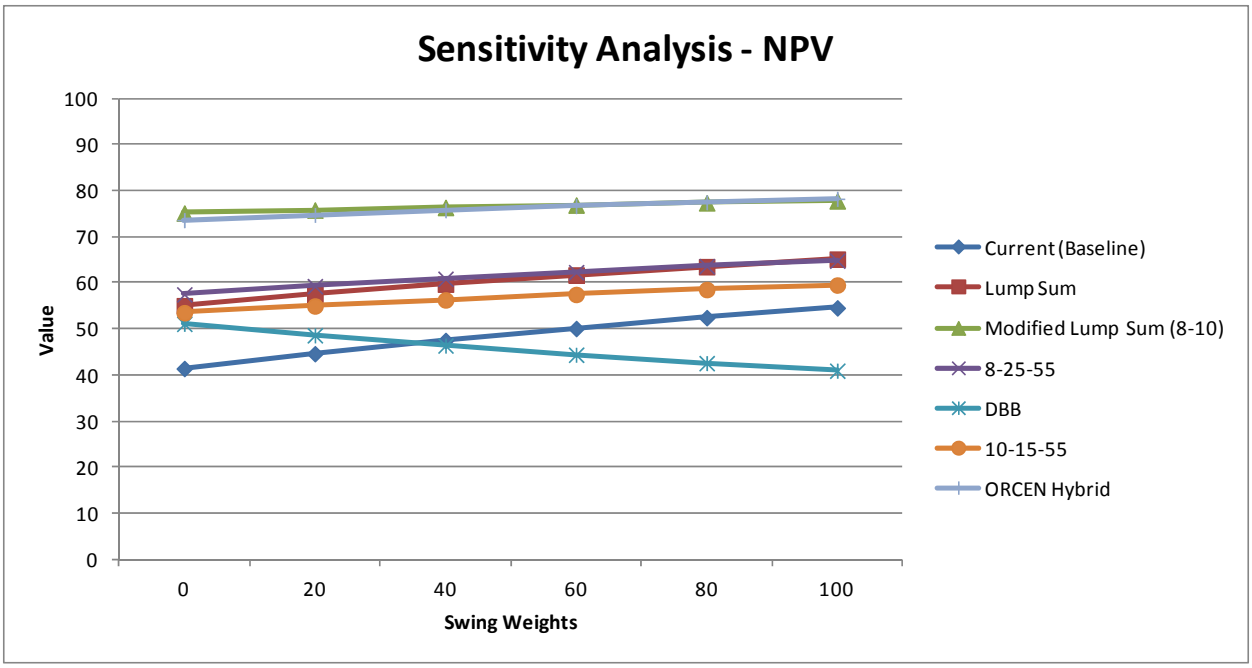
*50% of the DC contributions at 10 YOS, increasing by 10% annually to 100%

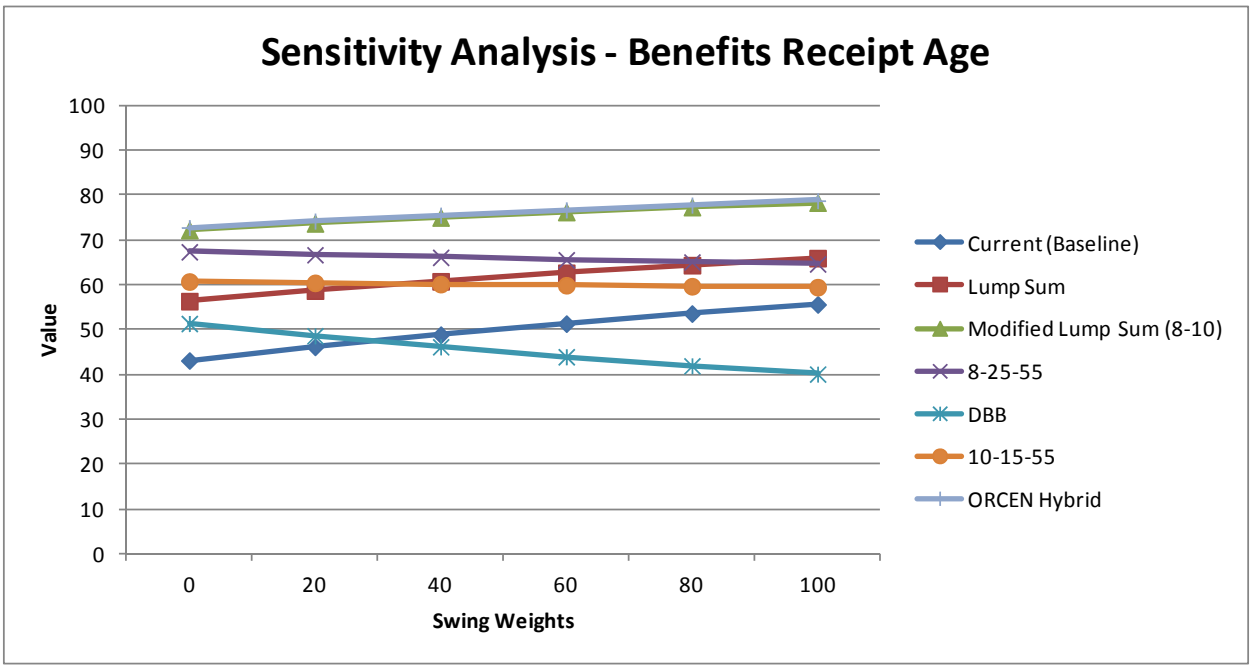
Appendix B: Retirement Alternatives-Cash Flows and Overview

ORCEN Hybrid

Vesting	8 YOS (DC); 20 YOS (DB)
Defined Contribution	5% Base Pay Match (Paid Monthly)
Defined Benefit	2.5% * YOS * High-3
DB Payout Method	Lump Sum (Retirement to Age 67); Annuity (Age 67)
Transition Pay	None
Transferability	100% DC; 100% Lump Sum

Appendix C: Value Measure Swing Weight Sensitivity Graphs





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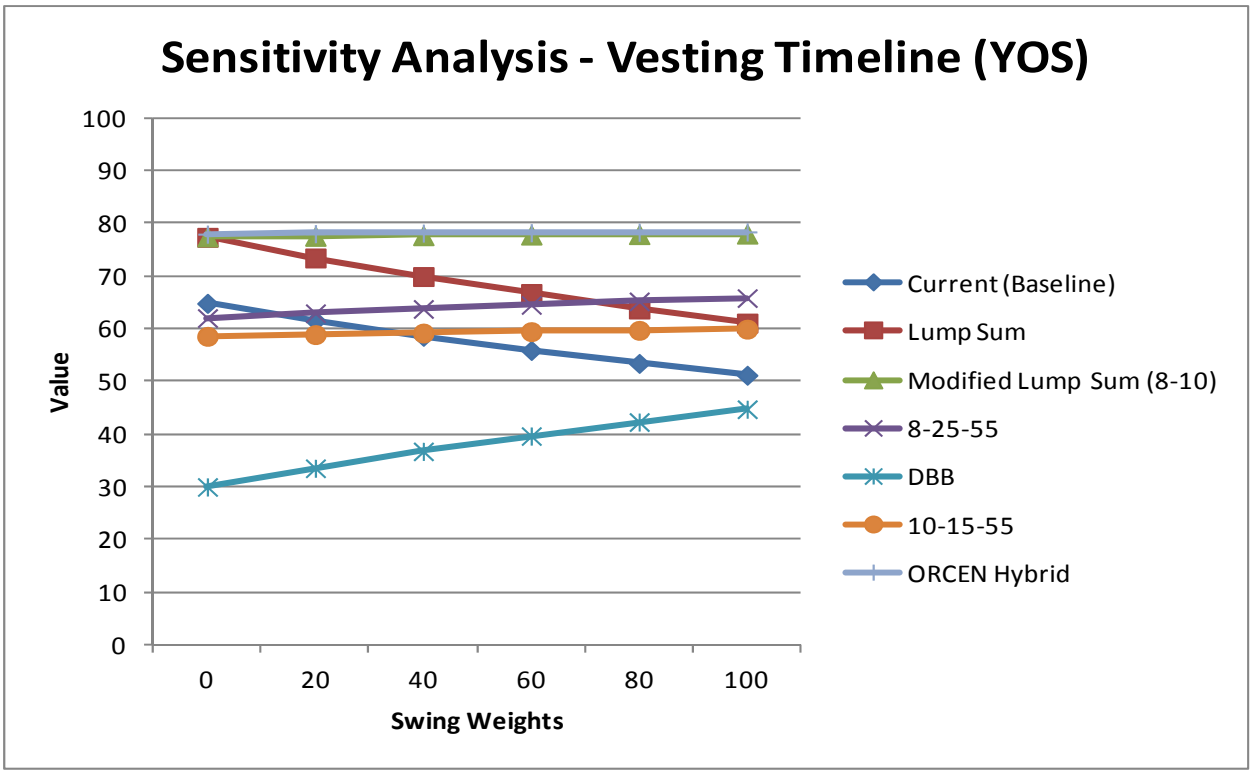

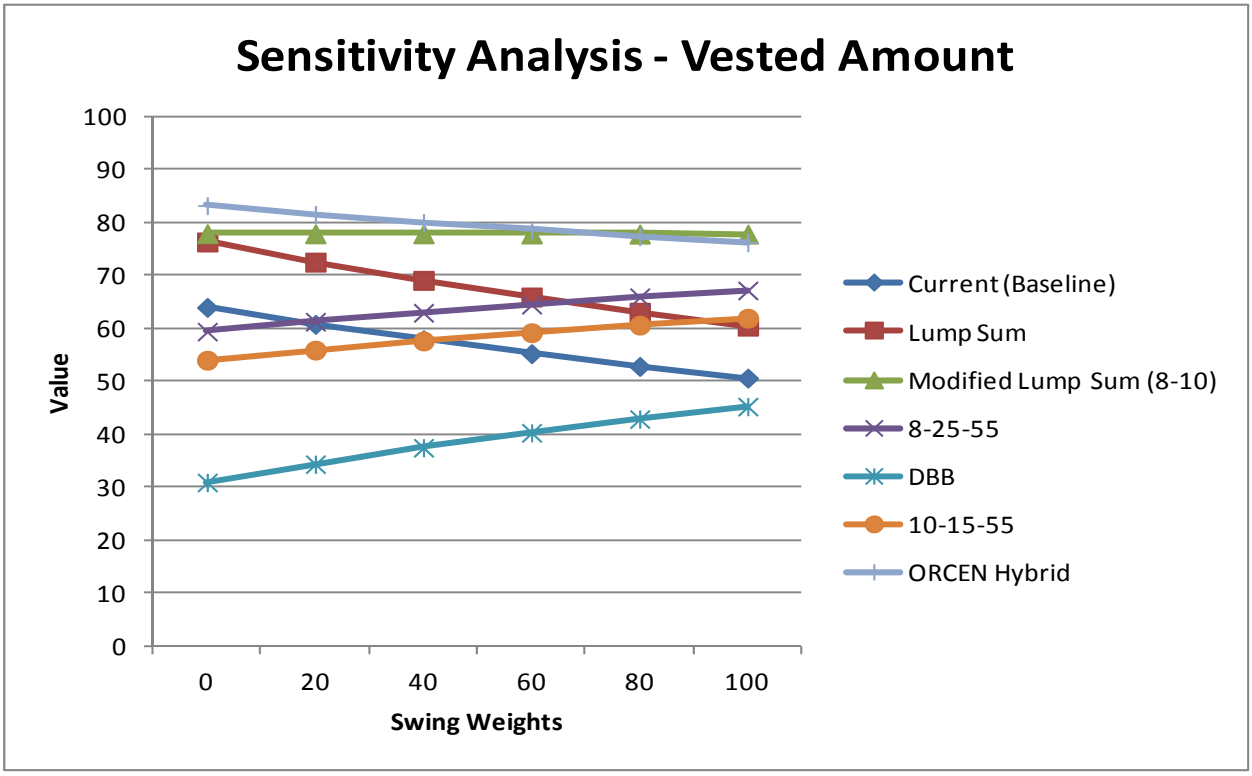

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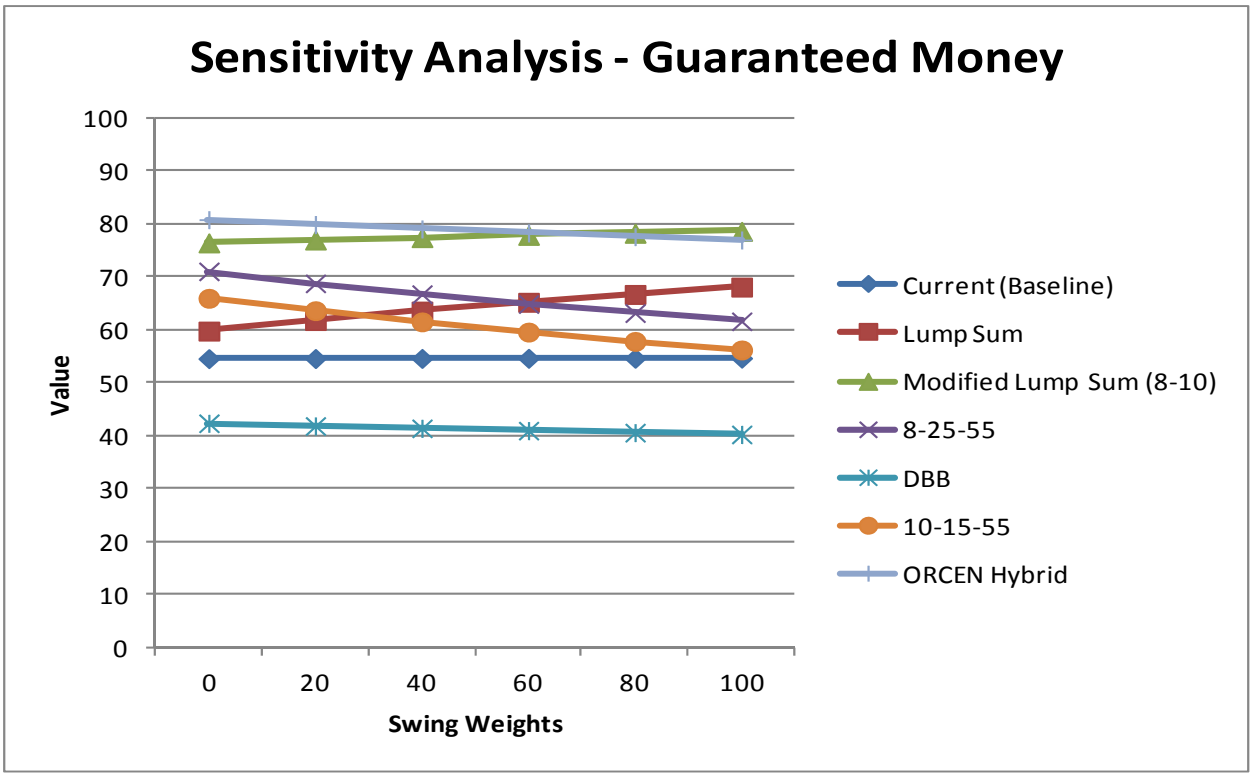

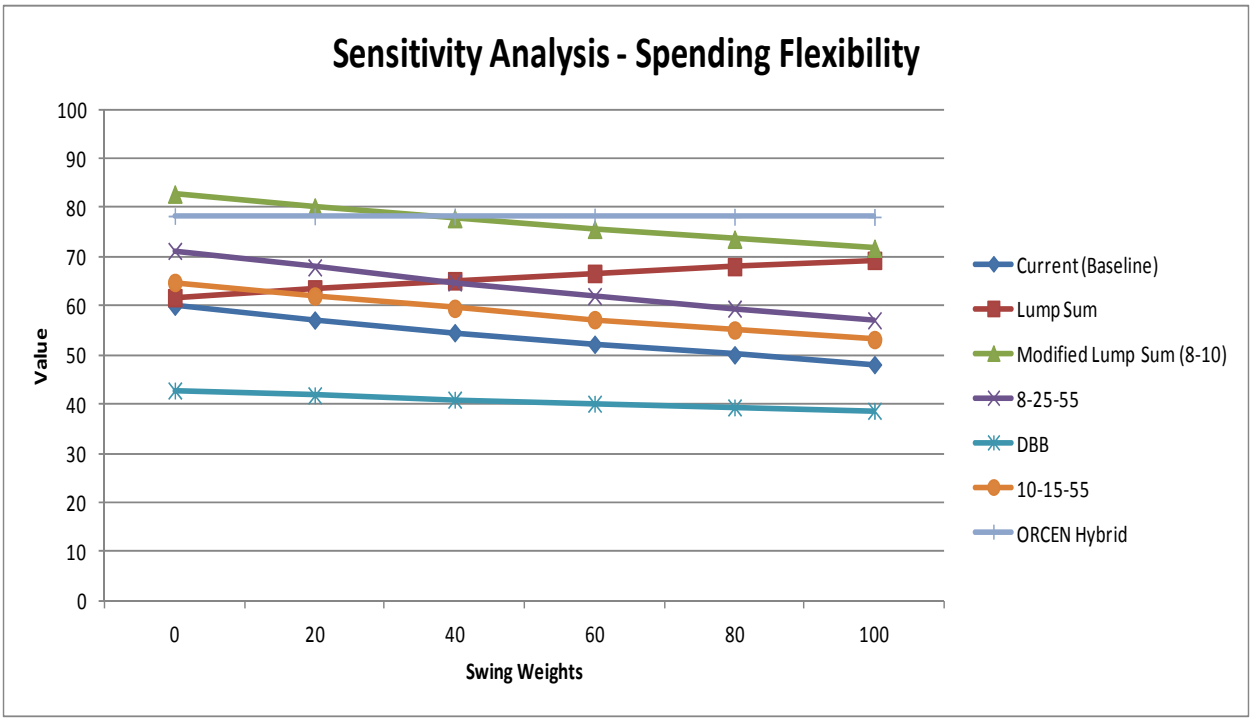

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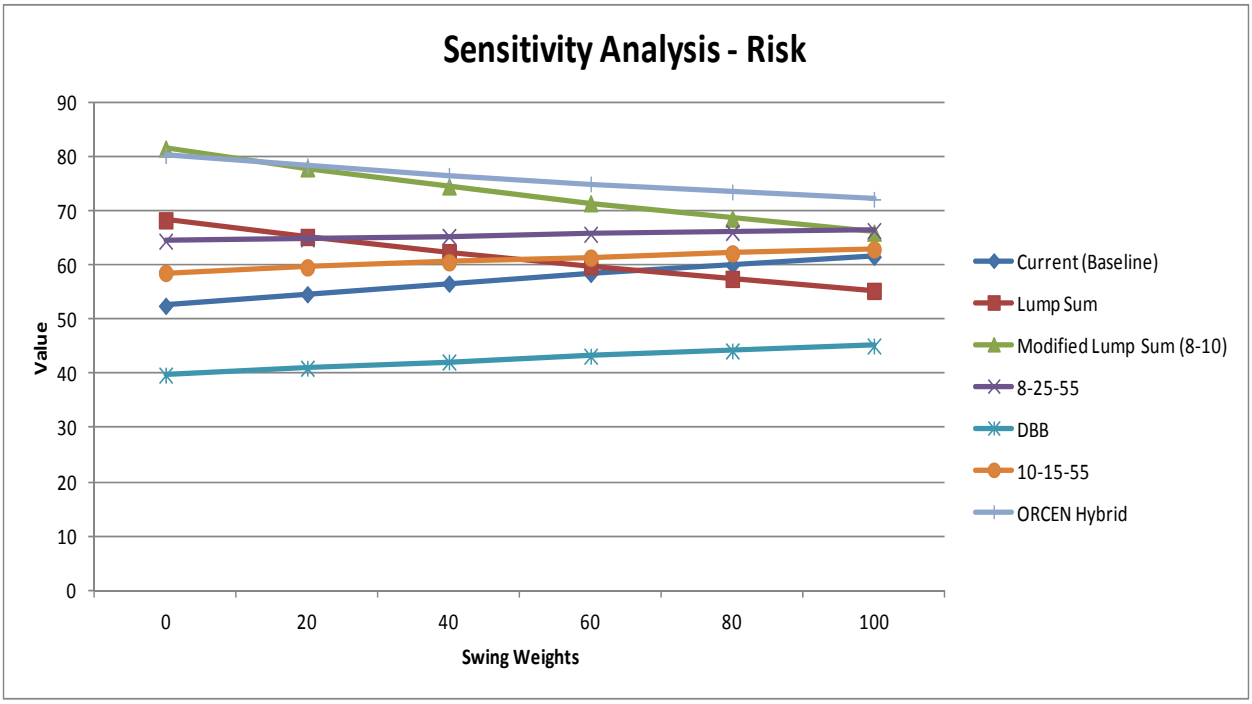

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14. ABSTRACT

In today's fiscally constrained environment, it is financially prudent to review all government programs to seek efficiencies and potential cost reductions. The Military Retirement System is no exception. The subject of retirement benefits for the members of our armed forces evokes strong interest among a diverse stakeholder group. Recent reviews of the Military Retirement System have been the subject of much discussion in the media. In view of this, a comprehensive evaluation framework must underpin any decision to change the current system. This work describes a methodology, rooted in value-focused thinking, which quantifies the trade-space of the Military Retirement System. We utilize this methodology to build a model through which to analyze and compare the current system with six alternatives. We present the results of this comparative analysis in terms of the cost of each alternative relative to the value each generates. While highlighting some important results, this study demonstrates an effective methodology to evaluate the trade-space of complex and resource intensive manpower decisions.

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Military Retirement System, Military Retirement, Retirement, Military Pension

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